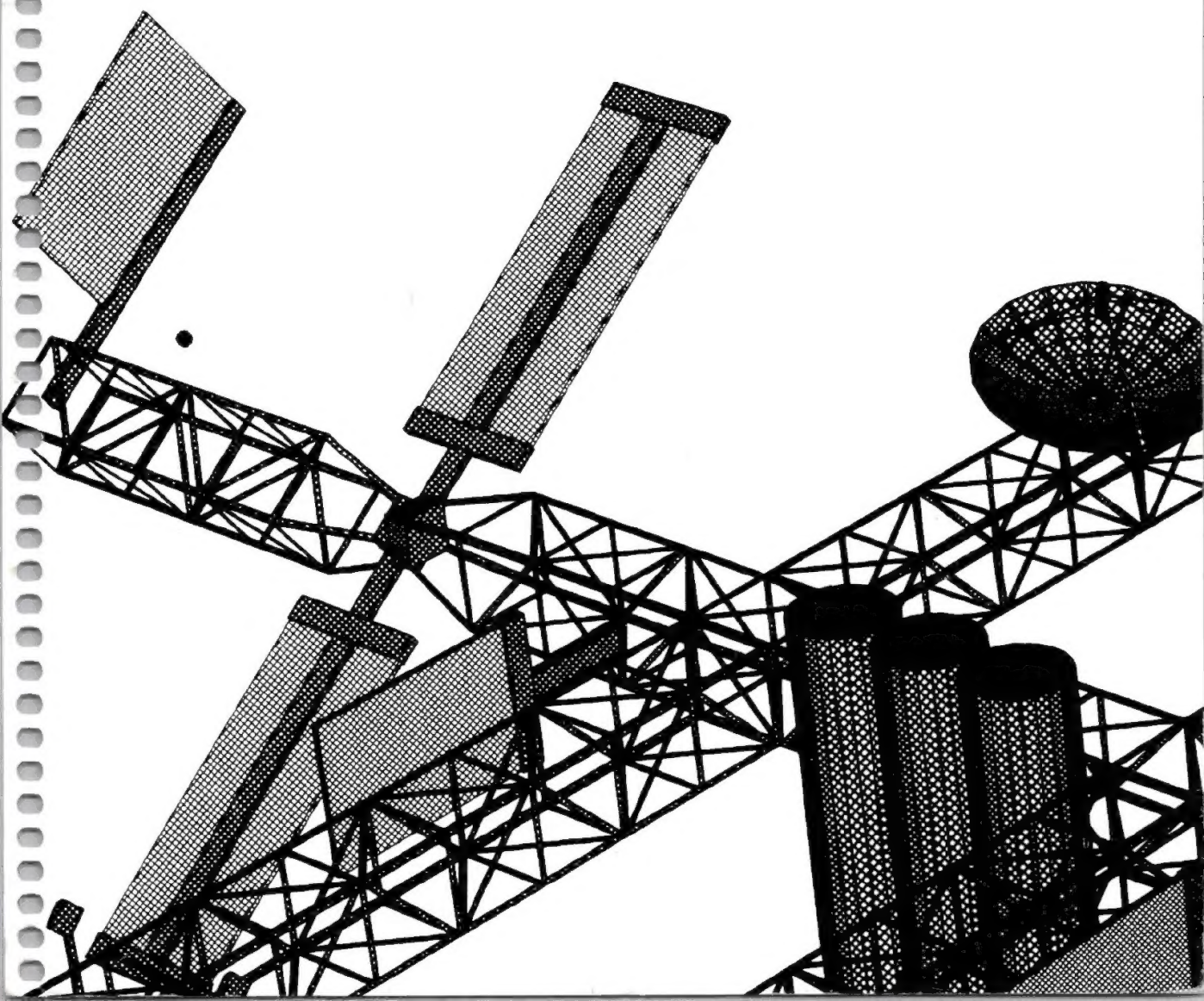# DMP-160

SERIES PLOTTERS

OPERATION MANUAL

DMP–160 SERIES PLOTTERS

OPERATION MANUAL

HOUSTON INSTRUMENT™
A Summagraphics Company

NOTE

This equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference in which case the user will be required to correct the interference at his own expense. CAUTION! Changes or modifications, not expressly approved by Houston Instrument who is responsible for FCC compliance, could void the users authority to operate this equipment.

NOTICE

This plotter does not exceed the Class A limits for radio noise for digital apparatus set out in the Radio Interference Regulations of the Canadian Department of Communications.

HOUSTON INSTRUMENT PRIORITY RESPONSE WARRANTY

For warranty information for your Houston Instrument DMP-160 Plotter, refer to the warranty card in the back of this manual.

OSHA CHEMICAL HAZARD COMMUNICATION STANDARD

Finished products manufactured and sold by Houston Instrument are not hazardous under the criteria identified per 29 CFR 1910.1200 (g) (2).

The writing pens used with this plotter are encapsulated in plastic and are considered an "article" under OSHA Chemical Hazard Communication "Employee Right To Know" standard 1910.1200 (b) (5) (iv).

DISCLAIMER OF USE

Houston Instrument DMP-160 Series Plotters produce high–quality plots when used in accordance with the instruction manual. These plotters are not intended for any other use.

There are no customer–serviceable parts inside this instrument. All repairs are to be made by authorized Houston Instrument service personnel.

IMPORTANT SAFETY INSTRUCTIONS

1.   Read all of these instructions.

2.   Save these instructions for later use.

3.   Follow all warnings and instructions marked on the plotter.

4.   Unplug this unit from the wall outlet before cleaning. Do not use liquid cleaners or aerosol cleaners. Use a damp cloth for cleaning.

5.   Do not use the plotter near or in water.

6.   Slots or openings in the cabinet and the back or bottom are provided for ventilation; to ensure reliable operation of the product and to protect it from overheating, these openings must not be blocked or covered. The openings should never be blocked by placing the unit on a bed, sofa, rug, or other similar surface. This product should never be placed near or over a radiator or heat register. This product should not be placed in a built–in installation unless proper ventilation is provided.

7.   The plotter should be operated from the type of power source indicated on the marking label. If you are not sure of the type of power available, consult your dealer or local power company.

8.   The plotter is equipped with a three–wire grounding type plug, which is a plug having a third (grounding) pin. This plug will fit only into a grounding–type power outlet. This is a safety feature. If you are unable to insert the plug into the outlet, contact your electrician to replace your obsolete outlet. Do not defeat the purpose of the grounding–type plug.

9.   Do not allow anything to rest on the power cord. Do not locate the plotter where persons will walk on the cord.

10. If an extension cord is used with the plotter, make sure that the total of the ampere ratings on the products plugged into the extension cord does not exceed the extension cord ampere rating. Also, make sure that the total of all products plugged into the wall outlet does not exceed 15 amperes.

11. Never push objects of any kind into the plotter through cabinet slots since they may touch dangerous voltage points or short out parts that could result in a risk of fire or electrical shock. Never spill liquid of any kind on the plotter.

12. Do not attempt to service the plotter yourself. Opening or removing those covers marked "Do Not Remove" may expose you to dangerous voltage points or other risks. Refer all servicing in those compartments to service personnel.

13. Unplug the plotter from the wall outlet and refer servicing to qualified personnel under the following conditions:

   A.   When the power cord or plug is damaged or frayed.

   B.   If liquid has been spilled into the plotter.

   C.   If the plotter has been exposed to rain or water.

D.   If the plotter does not operate normally when operating instructions are followed. Adjust only those controls that are covered by the operating instructions since improper adjustment of other controls may result in damage and will often require extensive work by a qualified technician to restore this product to normal operation.

E.   If the plotter has been dropped or the cabinet has been damaged.

F.   If the plotter exhibits a distinct change in performance, indicating a need for service.

NOTICE

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> Technical Publications
> Houston Instrument
> 8500 Cameron Road
> Austin, Texas 78753
> USA

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MANUAL REVISION HISTORY

DATE	NOTES
OCT 91	Original issue.

SECTION 1
QUICK START

NOTE

Be sure to read this section of this manual to get started. The remaining
sections are provided as reference information.

1.1 INTRODUCTION

Congratulations on your purchase of a Houston Instrument DMP-160 Series Plotter! We
know that you will find this to be a useful graphics tool and that you will receive many years
of service from it.

We also realize that most of us like to put our new computer accessories to work as soon as
possible. The DMP-160 Series Plotters have been carefully designed for both easy
installation and easy use. In most cases, you can use the following directions and have the
plotter operating with your computer and plotting software very quickly.

Please keep in mind that these directions are simply intended as a quick way to help you use
your new plotter. If you have any difficulty, refer to the referenced sections of this manual.

1.2 MANUAL ORGANIZATION

This manual is the DMP-160 Series Plotters Operation Manual, part number MI–1179. It
contains the information needed for installation and operation of the plotter. For ease of
reference, this manual is divided into sections and appendixes of related topics. A table of
contents in the front of the manual serves as an outline to these topics. An index in the back
of the manual helps you find specific information. A glossary is also provided in the back of
the manual.

●   Section 1 is Quick Start information to help you set up your plotter and get it going
        as soon as possible.

- Section 2 contains *Operation* information to help you become familiar with the plotter.

- Section 3 is *Charts* and Section 4 is *Pens*. These sections explain the plotting supplies used with your plotter.

- Sections 5 through 10 are devoted to the *Menus* used to configure the plotter to your requirements and preferences.

- Section 11 contains *Maintenance* information for operator maintenance of the plotter.

- Sections 12, 13, and 14 contain information about the *DM/PL, HP-GL,* and *HP-GL/2* plotting languages.

- Appendixes A and B, are devoted to *General Information and Interface Information.*

1.3 PLOTTING YOUR FIRST PLOT

In the following paragraphs, you will learn to:

- Assemble and install the plotter,

- Set the chart size and load a chart,

- Install pens,

- Verify plotter operation by plotting the internal CONFIDENCE plot.

1.3.1 Assembly And Installation

☐ Unpack the plotter, stand, and accessories from the shipping boxes. It is recommended that you save the packing material because it has been specially designed to protect the equipment for storage or shipment. (The packing material may be needed as evidence if filing a shipping damage claim.) In any case, be sure to save the packing material at least until operation of the plotter is verified.

CAUTION

Verify your actions in the next step. Otherwise, damage to the plotter may result if you attempt to operate the plotter on the wrong voltage.

☐ Look at the power entry module on the bottom of the plotter. The power entry module uses a pin to indicate the plotter's voltage setting (see Figure 1–1). Be sure the indicated voltage matches the line voltage at your site (100, 120, 220, or 240 Vac). If not, refer to Paragraph 11.3.
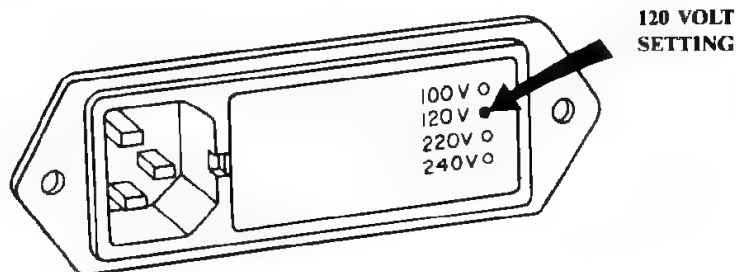
FIGURE 1–1. EXAMPLE 120 VOLT SETTING

CAUTION

Do not operate the plotter until after you have assembled the floor stand and attached the plotter to it. Otherwise, damage to the plotter or the plotting materials may result.

☐   For Model DMP-161 and Model DMP-162, assemble the plotter stand and attach the plotter to the stand using the instructions packed with the stand.

☐   For Model DMP-162R, assemble the plotter stand, attach the plotter to the stand and install the rollfeed assembly using the instructions packed with the stand.

☐   Place the MP-80 pen changer on top of the plotter as shown in Figure 1–2. Route the pen changer cable through the small groove in the pen changer base. Connect the cable to the socket on the bottom of the pen changer. Hand–tighten the two captive screws on the base of the pen changer to attach it to the plotter, then tighten them using a screwdriver. Be sure that the pen changer arm is lowered and latched into operating position.

If you have any trouble with the pen changer, refer to Paragraph 11.4.
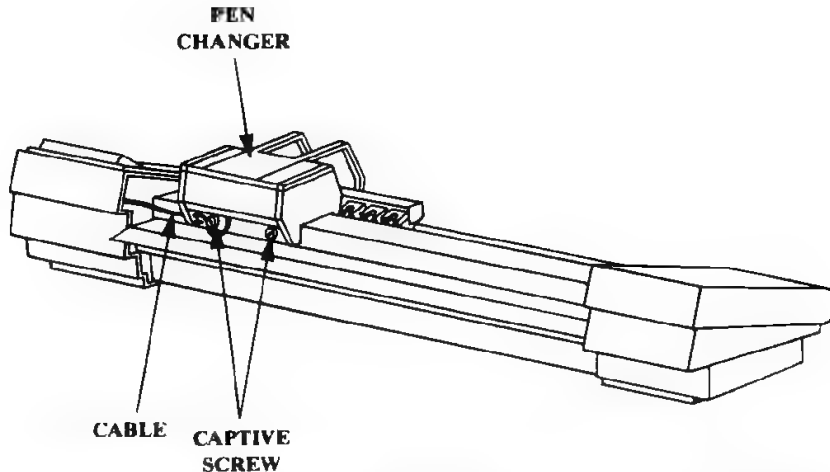
FIGURE 1–2. MP–80 PEN CHANGER INSTALLATION

☐   If installing the optional scanner accessory, refer to the instructions packed with the Model 128A or 128AMC SCAN–CAD scanner.

NOTE

Safety Ground Installation: An insulated grounding conductor that is identical in size, insulation material, and thickness to the grounded and ungrounded branch–circuit supply conductors except that it is green with or without one or more yellow stripes should be installed as part of the branch circuit that supplies power to the wall outlet.

The grounding conductor described above is to be grounded to earth at the electrical service equipment, or if supplied by a separately derived system, the grounding conductor should be at the supply transformer motor–generator set.

The attachment plug receptacles in the vicinity of the unit are to be of a grounding type, and the grounding conductors serving these receptacles are to be connected to earth ground of the service equipment.

□   Connect the power cord to the bottom of the plotter and to the power source. See Figure 1–11. The plotter's ground circuitry protects you from electrical shock. However, this protection is effective only if the ac outlet is properly grounded to earth. If the plotter is connected to a two–contact wall outlet, a 3/2 adaptor with grounding lug/wire may be used.This type of connection is illustrated in Figure 1–3. Be sure to read the safety instructions in the front of this manual before operating the plotter.

EUROPE:

MAKE SURE THIS IS
CONNECTED TO A
KNOWN GROUND

USA:

THREE-PRONG
OUTLET

MAKE SURE THIS IS
CONNECTED TO A
KNOWN GROUND

TWO-PRONG
OUTLET

GROUNDING
LUG OR WIRE

THREE-PRONG
PLUG

3-2 ADAPTOR
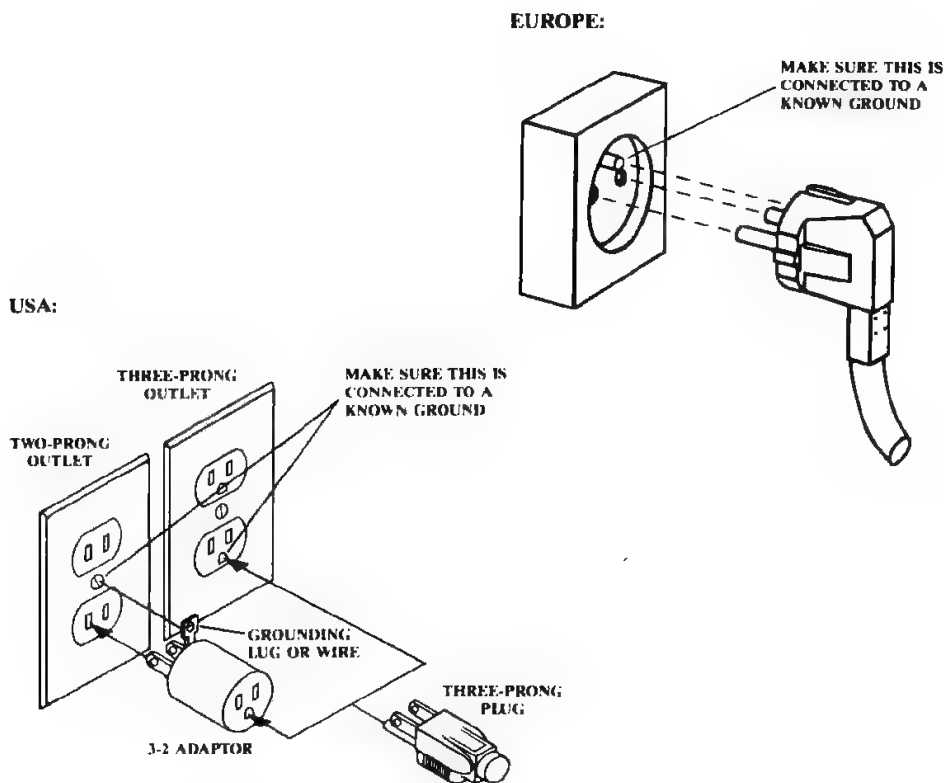
FIGURE 1–3. GROUND CONNECTION

☐ Find the POWER switch and set it to ON to power on the plotter. See Figure1–4. Notice that the plotter powers up with the fan on. The control panel displays SHEET NOT LOADED when the plotter is ready for use.

POWER
SWITCH
162R

POWER
SWITCH
161/162
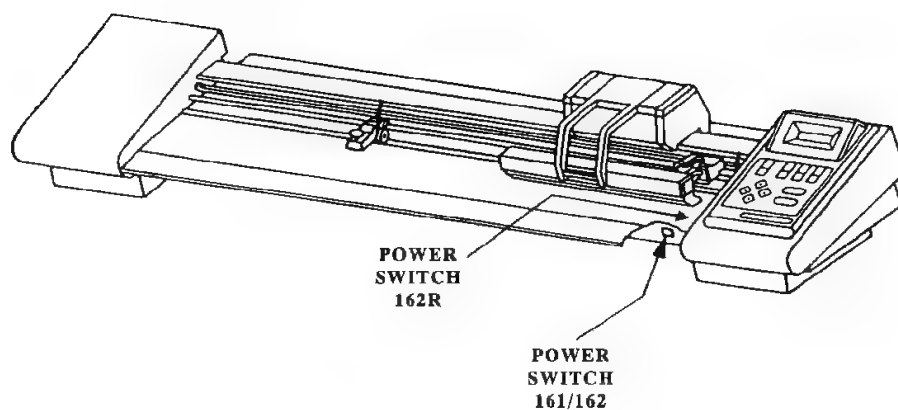
FIGURE 1–4. POWER SWITCH

1.3.2 Chart Size Setting

☐ Raise the left pinch roller arm (on the adjustable pinch roller). See Figure 1–5.
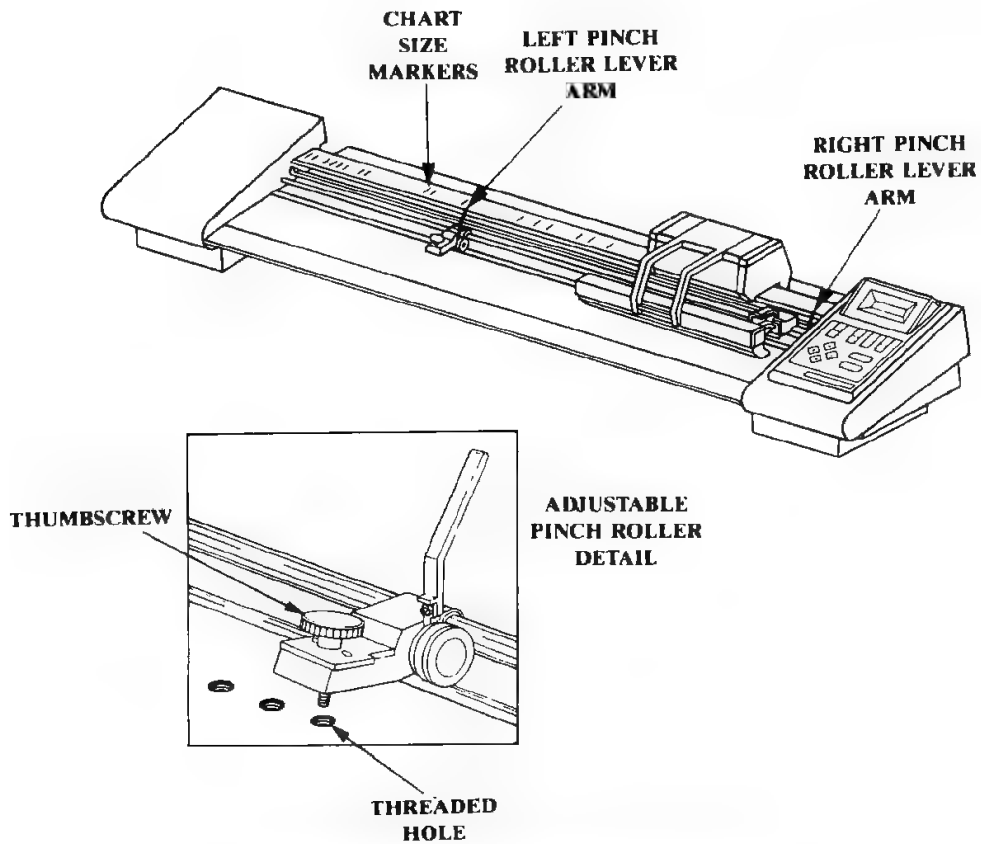
FIGURE 1–5. CHART SIZE SETTING

☐　Loosen the thumbscrew (counterclockwise) on the adjustable pinch roller. See Figure 1–5.

☐　Position the adjustable pinch roller so that the thumbscrew is aligned with the chart size marker (on top of the plotter) that matches the size of the chart you are using. Insert the thumbscrew into the corresponding threaded hole on the platen, then tighten the thumbscrew (clockwise).

　　If you have any difficulty with chart size setting, refer to Section 3.

1.3.3　Chart Loading

Cut sheet charts can be loaded on Model DMP-161, Model DMP-162, and Model DMP-162R. Roll charts can be loaded on Model DMP-162R.

NOTE

To activate a control panel key, be sure to press directly on the key label.

☐　To load a cut sheet chart, raise the left and right pinch roller arms. For the DMP-162R, make sure the media guide wireform and wireform basket are in their storage positions. Slide the cut sheet chart under both pinch rollers. When loading larger size charts, you may find it easier to insert the chart from the rear of the plotter. When loading smaller charts, you may find it easier to insert the chart from the front of the plotter. Carefully adjust the chart so that its right edge aligns with but does not cover the line on the right side of the platen. Align the front edge of the chart with the groove on the front of the platen. See Figure 1-6. Lower both pinch roller arms to secure the chart in the plotter.

　　For the DMP-162R plotter, press the **MENU** key until CONFIGURATION is displayed and press the **ENTER** key. Press the up arrow or down arrow key to display CHART FEED. Press the left arrow or right arrow key to display CUT SHEET and press **ENTER**.
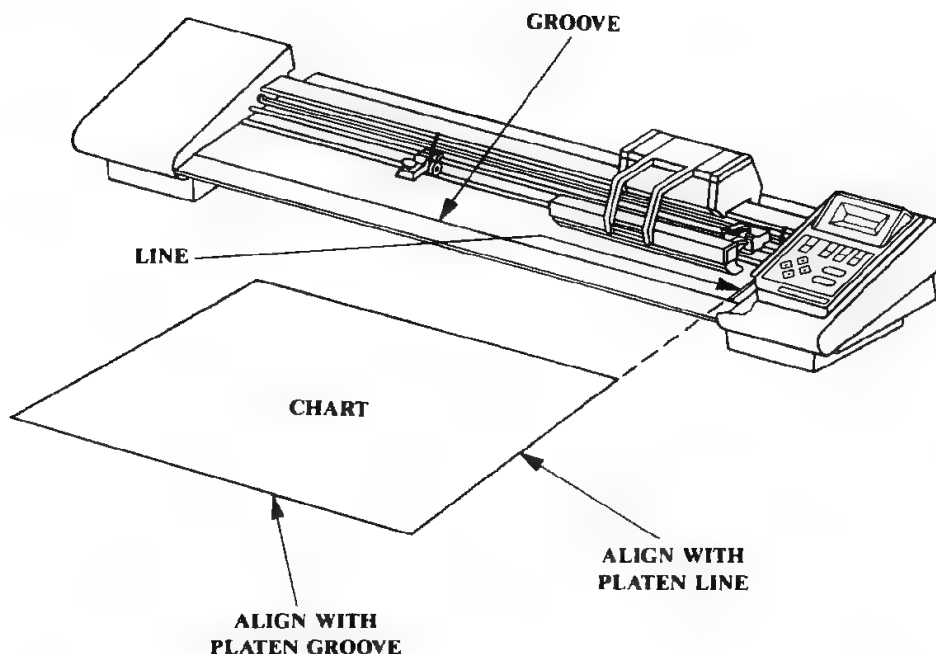
FIGURE 1–6. LOADING A CUT SHEET CHART

☐ To load a roll chart on the DMP-162R plotter, make sure the media guide wireform is in its storage position. Also make sure the wireform basket is in its correct position for the size of media you are loading (storage position for a roll chart smaller than a size D, D position for a D-size roll chart, or E position for an E-size roll chart). See Figure 1–7.

Check the end of the roll that will be nearest the plotter's control panel to be sure that the end is smooth and undamaged. Remove the roll chart shaft from the plotter and load the roll onto the shaft assembly. Place shaft assembly with roll on plotter. See Figure 1-7.

Raise the left and right pinch roller arms. Place the media guide wireform in its upper position. Feed the end of the roll around the outside of the guide, over the platen, and under the pinch roller arms. Lower both pinch roller arms to secure the chart in the plotter. See Figure 1-8.

Press the **MENU** key until CONFIGURATION is displayed and press the **ENTER** key. Press the up arrow or down arrow key to display CHART FEED. Press the left arrow or right arrow key to select FULL ROLL Mode and press **ENTER**.

MEDIA GUIDE
WIREFORM
(STORAGE
POSITION)

ROLL CHART
SHAFT

CHART
ROLL

REMOVABLE
END CAP
ASSEMBLY

WIREFORM
BASKET

STORAGE
POSITION - "C"

D POSITION - "A"

E POSITION - "B"
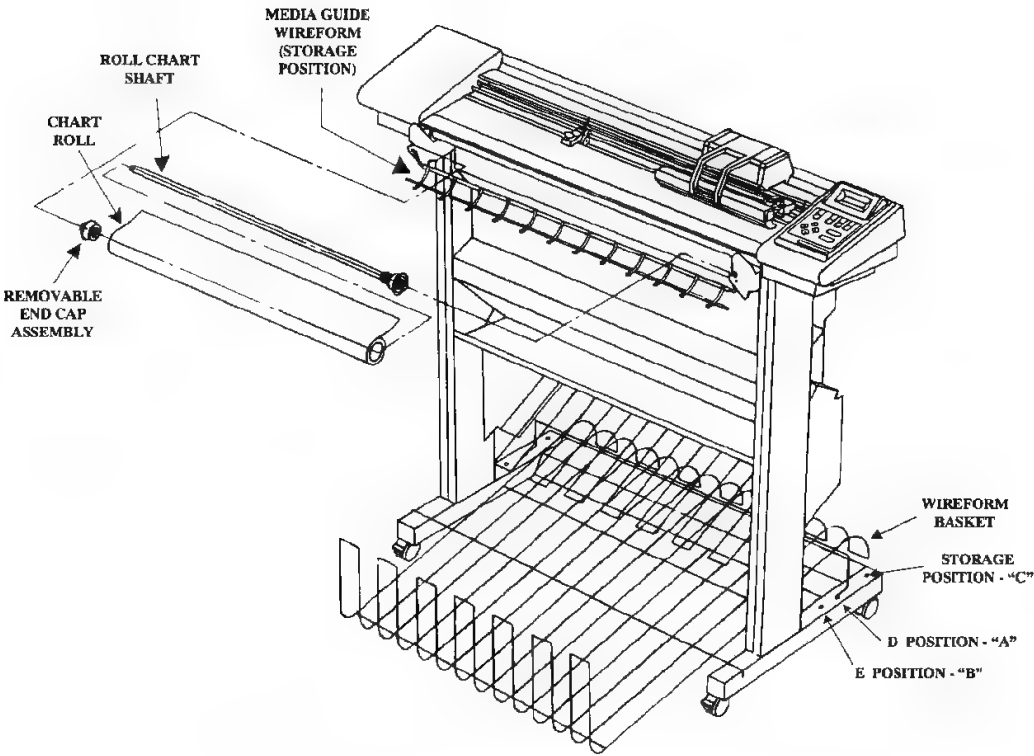
FIGURE 1-7. INSTALLING ROLL SHAFT WITH ROLL

PINCH ROLLER ARM

PLATEN

ROLL CHART

MEDIA GUIDE
WIREFORM
(UPPER POSITION)

MEDIA GUIDE
WIREFORM
(STORAGE POSITION)
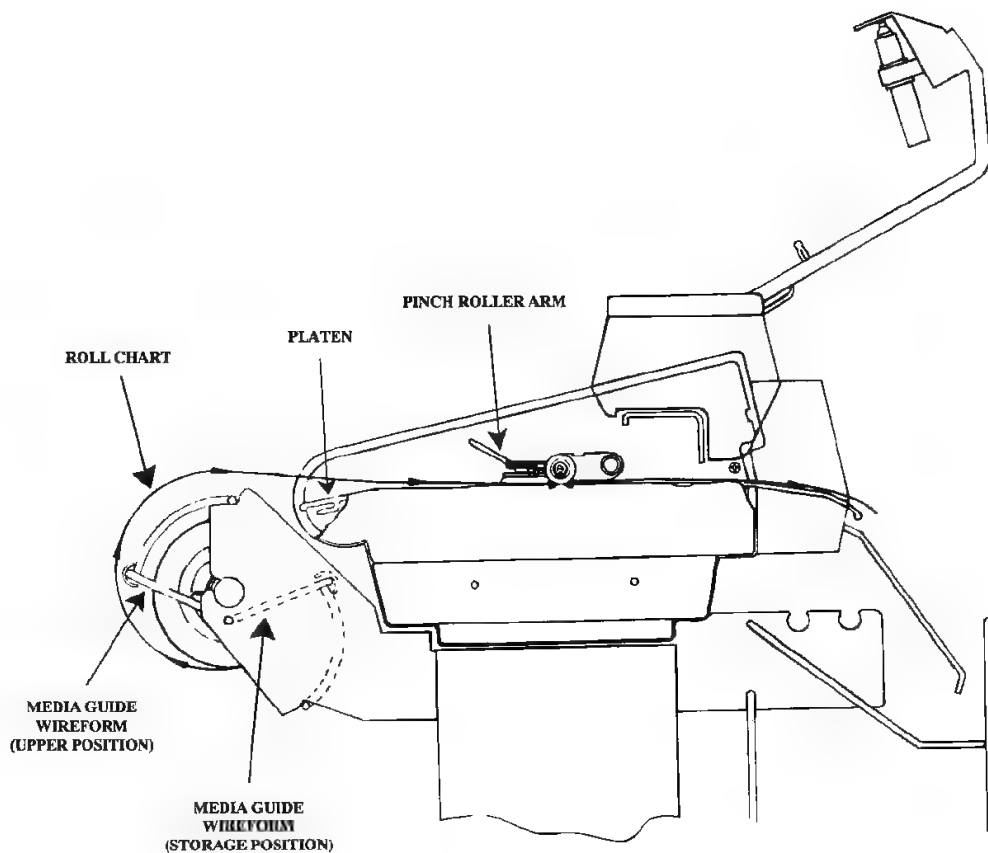
FIGURE 1-8. LOADING A ROLL CHART

☐ Press the control panel **RESET/LOAD** key one time. Notice that LOAD is displayed on the control panel. Press the **ENTER** key to load the chart. The plotter moves the pen carriage left to find the width of the chart and allows you to trim the edge of the media. It then pulls a full chart size frame from the roll, delays **LOAD DELAY** minutes, and shuffles the media to set the pinch roller tracks.

If you have any difficulty with chart loading, refer to Section 3.

1.3.4 Pen Installation

☐ Prepare the disposable technical drafting pens using the instructions packed with the sample pens.

☐ A pen is installed by pressing the wide part into the jaws of the pen changer pen stall. See Figure 1–9. Install pens installs 1 through 8 of the pen changer, and leave the plotter pen holder empty. You may find it easier to temporarily raise the pen changer arm to install the pens, then latch the pen changer arm in the lower position.

Refer to Section 4 for more information if you have any trouble with pen loading.
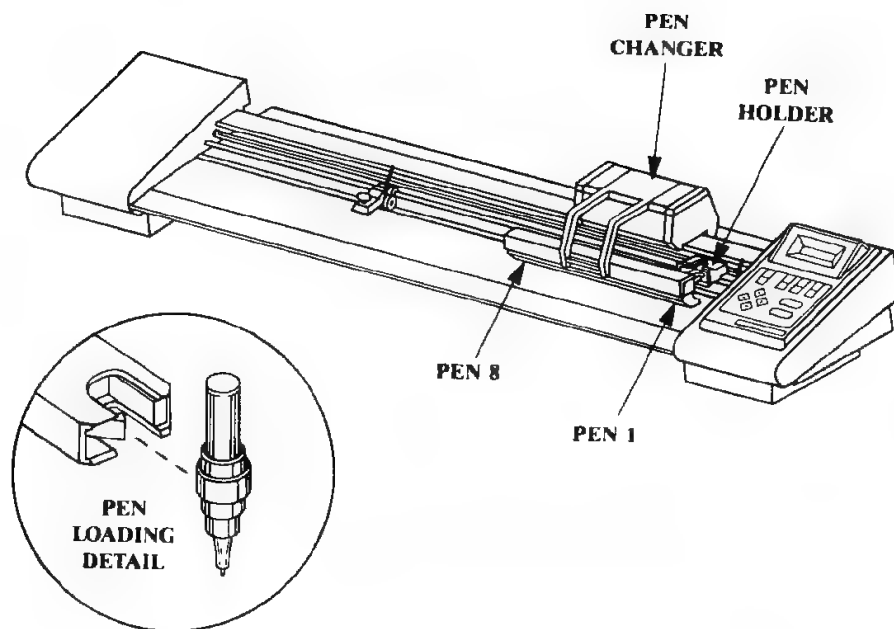
FIGURE 1–9. PEN INSTALLATION

1.3.5 Plotting The Internal CONFIDENCE Plot

☐ Press the control panel **MENU** key once to access the plotter menu system. Continue pressing and releasing the **MENU** key until INTERNAL PLOTS is displayed on the control panel. Press the left arrow or right arrow key until CONFIDENCE is displayed on the control panel. Press the **ENTER** key to start the customer confidence test plot. Refer to Figure 1–10. Successful completion indicates that the plotter is operational.

☐   When the test plot is completed, you are given the option of loading a new chart. If you currently are using a cut sheet chart, raise the left and right pinch roller arms and remove the chart. If you currently are using a roll chart and want to remove the plot without loading the next frame, select NO by pressing the **2** key. Press the **RESET/LOAD** key. Press the left arrow or right arrow key until cut is displayed and press the **ENTER** key.

☐   Set the POWER switch to OFF.
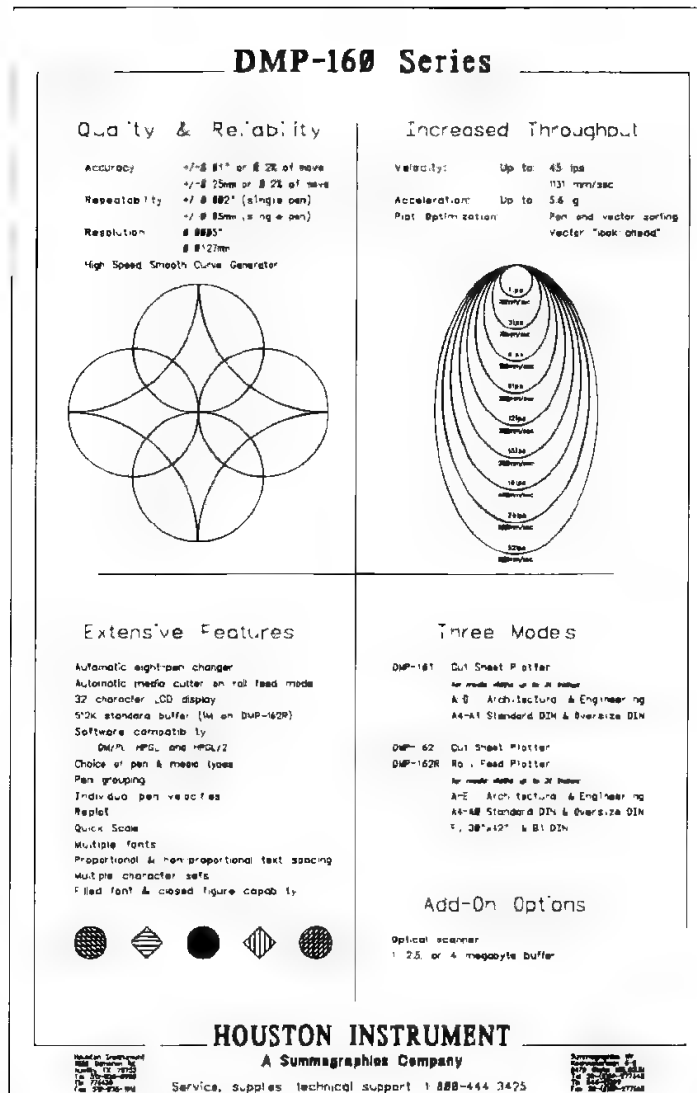
FIGURE 1–10. CUSTOMER CONFIDENCE TEST PLOT

1.4 INTERFACE TO THE COMPUTER

The steps in the previous paragraphs verified that your plotter is operational and produces plots. In the following paragraphs, you will learn to:

● Connect the plotter to your computer,

● Use the menu to configure the plotter for use with your plotting software. DMP-160 Series Plotters are compatible with virtually all plotting software packages that support either DM/PL, HP-GL, or HP-GL/2. Specific instructions are provided to configure for AutoCAD and VersaCAD.

1.4.1 Data Cable Connection

NOTE

To ensure reliable operation, be sure to fasten the attaching screws when installing the data cable (and adaptor).

☐ If using the Houston Instrument Modular Serial Cable Kit (part number 414–183), connect its 25–pin connector to the data connector on the bottom of the plotter. See Figure 1–11. Connect the other end of the cable to your computer as follows:

● For an IBM-compatible computer with a 9–pin serial port, simply connect the data cable directly to the serial port.

● For an IBM-compatible computer with a 25–pin serial port, connect the Houston Instrument 9–pin to 25–pin adaptor to the serial port. Then, connect the data cable to the adaptor.

● For an Apple Macintosh-compatible computer with an 8–pin DIN connector serial port, connect the Houston Instrument 9–pin to 8–pin adaptor cable to the serial port. Then, connect the data cable to the adaptor cable.

If you are making your own data cable or using any non Houston Instrument cable, then refer to your plotting application software manual for any particular cabling requirements. Otherwise, refer to Appendix B for more cabling information. Connect your data cable to the plotter and the host computer.

☐   Set the POWER switch to ON.
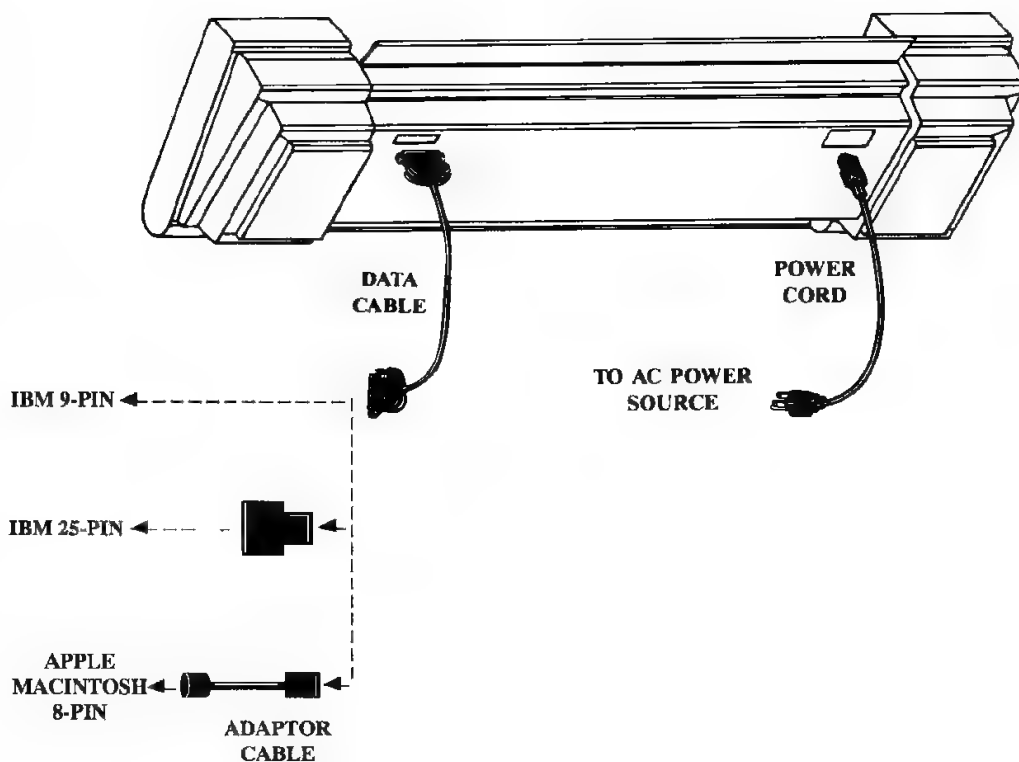
FIGURE 1–11. DATA CABLE CONNECTION

1.4.2   Configuring The Plotter

The following exercise shows you how to use the plotter's menu system to minimally configure the plotter and select the active plotting language. The plotter can operate with DM/PL, HP-GL, HP-GL/2, or SCAN–CAD as the active plotting language, as described in the following steps.

Choose a language or plotter supported by your plotting software. Then configure the plotter to match that language or plotter as listed below. It is IMPERATIVE that the plotter language match the language used by the host software.

HOST SOFTWARE LANGUAGE OR PLOTTER MODEL	DMP-160 SERIES PLOTTER LANGUAGE SELECTION
DM/PL plot language	DM/PL
DMP-61 plotter	DM/PL
DMP-62 plotter	DM/PL
DMP-61 DL plotter	DM/PL
DMP-62 DL plotter	DM/PL
DMP-161 plotter	DM/PL
DMP-162 plotter	DM/PL
DMP-162R plotter	DM/PL
HP-GL plot language	HP-GL
HP 7585 plotter	HP-GL
HP 7586 plotter	HP-GL
HP-GL/2 plot language	HP-GL/2
HP DraftMaster SX/RX plotter	HP-GL/2
SCAN–CAD scanner accessory	SCAN–CAD

NOTE

The plotter's factory default menu settings will work with many software packages. However, be sure to read your software manual to determine any software–specific setup requirements.

☐ Press the control panel **MENU** key to access the plotter menu system. Press the **MENU** key until CONFIGURATION is displayed on the control panel. Then press the **ENTER** key to access the CONFIGURATION menu.

☐ For the Model DMP-162R plotter only, press the control panel down arrow key until CHART FEED is displayed on the control panel. Press the left arrow or right arrow key until the desired chart type (CUT SHEET, FULL ROLL, HALF ROLL, or MANUAL ROLL) is displayed. Then press the **ENTER** key to activate your selection.

☐ Press the control panel down arrow key until # OF PENS is displayed on the control panel. Press the left arrow or right arrow key until the number of pens you wish to use is displayed (1 to 8). Then press the **ENTER** key to activate your selection. (The active selection is marked with an asterisk [*] in the menu.)

☐ Press the control panel down arrow key until LANGUAGE is displayed on the control panel. Press the left arrow or right arrow key until the plotting language that matches your plotting software language requirement is displayed (DM/PL, HP-GL, or HP-GL/2). When actually using the plotter with the Houston Instrument SCAN–CAD scanner software, select SCAN–CAD as the plotting language. Then press the **ENTER** key to activate your selection.

☐ Press the control panel down arrow key until BAUD RATE is displayed on the control panel. Press the left arrow or right arrow key until the baud rate that matches your plotting software baud rate requirement is displayed (2400, 4800, 9600, 19200, or 38400 BAUD). Then press the **ENTER** key to activate your selection.

☐   Press the control panel down arrow key until PARITY is displayed on the control panel. Press the left arrow or right arrow key until the parity that matches your plotting software parity requirement is displayed (NONE, MARK, EVEN, or ODD parity). Then press the **ENTER** key to activate your selection.

☐   Press the control panel down arrow key until RTS/DTR is displayed on the control panel. Press the left arrow or right arrow key until the handshake mode that matches your plotting software handshake requirement is displayed. In general, select TOGGLE for hardware handshaking or HIGH for software or XON/XOFF handshaking. Then press the **ENTER** key to activate your selection.

☐   If using HP-GL or HP-GL/2, press the control panel down arrow key until LINE STATUS is displayed on the control panel. Press the left arrow or right arrow key until the line status that matches your plotting software line status requirement is displayed (STANDALONE or EAVESDROP). If unsure, select STANDALONE. Then press the **ENTER** key to activate your selection.

☐   To review any of the above selections, press the control panel down arrow or up arrow key until the desired item is displayed on the control panel. The active selection is indicated with an asterisk (*). To alter a selection, press the left arrow or right arrow key until the desired item is displayed, then press the **ENTER** key to activate your selection.

When all items are verified, press the control panel **ONLINE** key once.

The plotter is now minimally configured for operation with your computer and plotting software. If you have any trouble with the configuration menu, then refer to Section 7 for more information.

1.4.3   Additional Information For AutoCAD And VersaCAD Setup

The following paragraphs provide specific instructions to set up the plotter for use with MS–DOS versions of AutoCAD or VersaCAD. For best results, set plotting software optimization to "PEN ONLY."

1.4.3.1   Configuration

For AutoCAD, set the following configuration in the plotter menus using Paragraph 1.4.2 as a guide:

OPTIMIZATION	ON
LANGUAGE	HP-GL/2
BAUD RATE	19200 or 38400
PARITY	EVEN
RTS/DTR	HIGH*

NOTES:

* Set to TOGGLE if plotting from other than AutoCAD's main menu.

For AutoCAD, use the supplied ADI driver and follow the installation notes. If you have AutoCAD 386 (Release 10 or 11), install the protected mode ADI plotter driver (DMPL386.EXP). If you have the standard DOS version of AutoCAD, install the real mode ADI plotter driver (DMPLADI.EXE). Installation instructions can be found on the floppy disk shipped with the plotter.

For VersaCAD, set the following configuration in the plotter menus using Paragraph 1.4.2 as a guide:

LANGUAGE	DM/PL
BAUD RATE	9600
PARITY	NONE

From the software, select either the DMP-161 or DMP-162 driver for your specific plotter model. (DMP-61, DMP-62, DMP-61 DL, or DMP-62DL can also be used.)

Configure the computer serial port from the software. For AutoCAD, choose "Configure AutoCAD" from the main software menu. Select the serial port (COM1 or COM2) to which the plotter is connected. For VersaCAD, choose "Environment" in the main software menu. Select the serial port (COM1 or COM2) to which the plotter is connected.

1.4.3.2 Clipping

Clipping occurs when the drawing size is too large to fit on the available plot area. The plot area is less than the chart size since the mechanism that holds the chart prevents the plotter from drawing on that area. The available plot area for each chart size is listed in Section 3. Note that if you plot to scale and the scale you choose does not fit within the available plot area, the plot will be clipped.

AutoCAD lists standard chart sizes rather than plot areas. To avoid clipping, set the "User" selection to the exact plot area available for the chart size that you are using and select plot to "Fit." This will prevent the plot from being clipped.

VersaCAD asks for the left border and the right border, and then queries the plotter and calculates the available plot area.

1.4.3.3   Pen Tip Width

The pen tip width value in AutoCAD and VersaCAD should be set to match the tip size actually in use. If the width value is set too large, solid fills and shadings will not be full density — white space will appear between the fill lines. If the width value is set too small, successive pen traces will overlap, causing excessive ink to be deposited on the media. This can lead to tearing of the chart and clogging of pens. Suggested pen tip width values are:

    0.25 mm pen tip width = 0.010 inch (technical pens)
    0.30 mm pen tip width = 0.012 inch (fiber–tip or roller ball pens)
    0.35 mm pen tip width = 0.014 inch (technical pens)
    0.50 mm pen tip width = 0.020 inch (technical pens)
    0.70 mm pen tip width = 0.028 inch (technical pens)

The pen tip width in VersaCAD can be set in the "Enviro" section of the program.

For Houston Instrument pens, the tip widths are printed on the pens.

1.4.3.4   Multi–Colored Plots

AutoCAD and VersaCAD must be told that the pen changer is installed on the plotter. Otherwise, multi–colored plots will be drawn with a single pen. In AutoCAD, choose "Layer" and specify PEN NUMBER for the pen color. In VersaCAD, choose "Properties" and then choose "Pen." Also, be sure that the # OF PENS configuration menu in the plotter is set to the number of pens installed in the pen changer.

1.4.3.5   Stray Lines

Stray or extraneous lines on a plot often indicate a communications problem between the host computer and the plotter. If you find such lines:

- Verify correct operation of the plotter alone by plotting the CONFIDENCE plot. See Paragraph 9.5. This plot does not depend on a connection to the host computer.

- Verify that the plotter and host computer communications parameters match. Check baud rate, number of data bits, parity, and RTS/DTR (handshaking).

- Verify that the data cable between the plotter and the host computer is good. Check that the correct pins are reliably connected. Substituting a known–good cable is a good, quick check.

- Verify that the serial port on the computer is functioning correctly. Try another port, or try another computer.

1.5   WHERE TO FIND ADDITIONAL INFORMATION

This completes the installation, check out, and minimal configuration of the plotter. Refer to Section 2 for information on the plotter itself, Sections 3 and 4 for more information about the plotting media, and to Sections 5 through 10 for information on customizing the plotter to your application and preferences.

Additional information needed for configuring your system may be found in documentation for the plotting software used on the host computer.

Load a cut sheet chart or roll chart as previously described in Paragraph 1.3.3, and you should be ready for plotting.

1.6   PRODUCT SUPPORT

Houston Instrument offers hardware and software support for all of its products. This help
is only a telephone call away. Please have the following information available when calling
Houston Instrument:

- The plotter's model number and serial number, which are printed on the
  identification tag on the back of the unit,

- The type of computer with which the plotter is being used,

- The name and revision number of the plotting software package,

- The cable configuration between the plotter and the computer,

- A copy of the last menu settings (if the plotter has ever been operated),

- A copy of the MENU or SERVICE plot, which provides the plotter's ROM
  revision levels (Paragraph 9.4 or 10.4).

- Any error message displayed on the control panel,

- The date of purchase,

- The type of maintenance agreement, if any,

- The name of the reseller, contact person, and phone number,

- A brief description of the problem.

After preparing the information requested above, you can contact Houston Instrument toll
free at 1-800-444-3425 for assistance. Your call will be received by the Call Center and
routed to the Technical Support Hardware or Technical Support Software group depending
on your question or problem type.

1.7   OTHER PRODUCTS

Information about other Houston Instrument products is available toll free from the Literature Department at 1-800-444-3425.

1.8   WARRANTY REGISTRATION

Remember to validate your warranty by sending in your completed warranty card (located in the back of this manual) or by calling the HI Warranty Registration Department toll free at 1-800-444-3425 for immediate registration.

1.9   ORDERING SUPPLIES

To order supplies for your plotter, contact your Houston Instrument product dealer, or call Houston Instrument toll free at 1-800-776-9989 (512-873-1395).

THANK YOU FOR CHOOSING THIS HOUSTON INSTRUMENT PLOTTER!

SECTION 2
OPERATION

2.1 INTRODUCTION

This section contains operating information for the plotter. This includes general information, model identification, accessories, operator controls, and normal operation.

2.2 GENERAL INFORMATION

Houston Instrument DMP-160 Series Plotters are fast, accurate, reliable, versatile, and easy to use for your plotting applications. These plotters produce outstanding graphics using a wide variety of chart types and sizes, with many popular pen types and colors. Detailed machine specifications are listed in Appendix A. A few of the features you'll find on your plotter are:

- A 32–character liquid crystal display (or LCD) with adjustable contrast and 12–key control panel for easy and convenient operator control.

- Selectable plotting languages. DM/PL is Houston Instrument's Digital Microprocessor/Plotting Language. You can also select emulation of the Hewlett-Packard HP-GL/2 language used in the HP DraftMaster SX/RX plotter. Also included is HP-GL, which allows the DMP-160 to emulate the HP 7585 plotter.

- Selectable plot code sorting to optimize plotter operation.

- Window and scaling capabilities to manipulate the size, location, and appearance of a plot.

- Selectable plotting speeds and accelerations.

- Selectable DM/PL English or metric menu operation.

- Multiple text character sets and DM/PL font styles that can be plotted in many different sizes, rotated to any slope, and be plotted in italics.

- Serial RS–232–C communications.

- Up to four separate user configurations can be saved and easily recalled.

- Use of cut sheet charts in many popular standard sizes.

- Use of roll charts in the DMP-162R plotter.

- Eight–pen pen changer included.

- Optional plotter enhancements include: larger buffer and optical scanner.

2.3   IDENTIFYING YOUR PLOTTER MODEL

There are three DMP-160 Series Plotter models: DMP-161, DMP-162, and DMP-162R. The model number is printed on a label on the back of the plotter and on a decal on the control panel. The important difference among models is the charts that each uses. The DMP-161 supports cut sheet charts up to 24 inches (607 mm) wide. The DMP-162 and DMP-162R support cut sheet charts up to 36 inches (914 mm) wide. The DMP-162R also supports roll media up to 36 inches (914 mm) wide. Otherwise, the three models are functionally identical. See Figure 2-1(a) and Figure 2-1(b). Unless noted, information in this manual applies to all three models.

These models are compatible with software for earlier Houston Instrument DMP-61, DMP-62, DMP-61 DL, and DMP-62 DL models, but the DMP-160 Series Plotters have enhanced software and performance features.
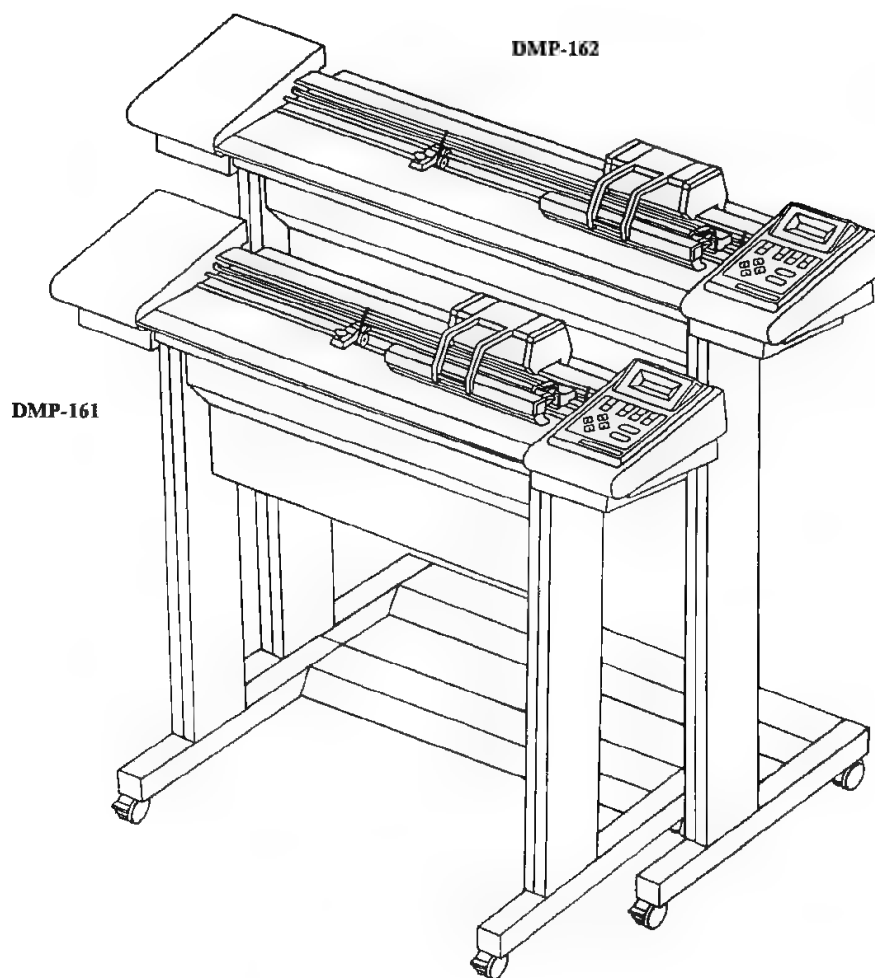
FIGURE 2–1(a). DMP-161 AND DMP-162 PLOTTERS
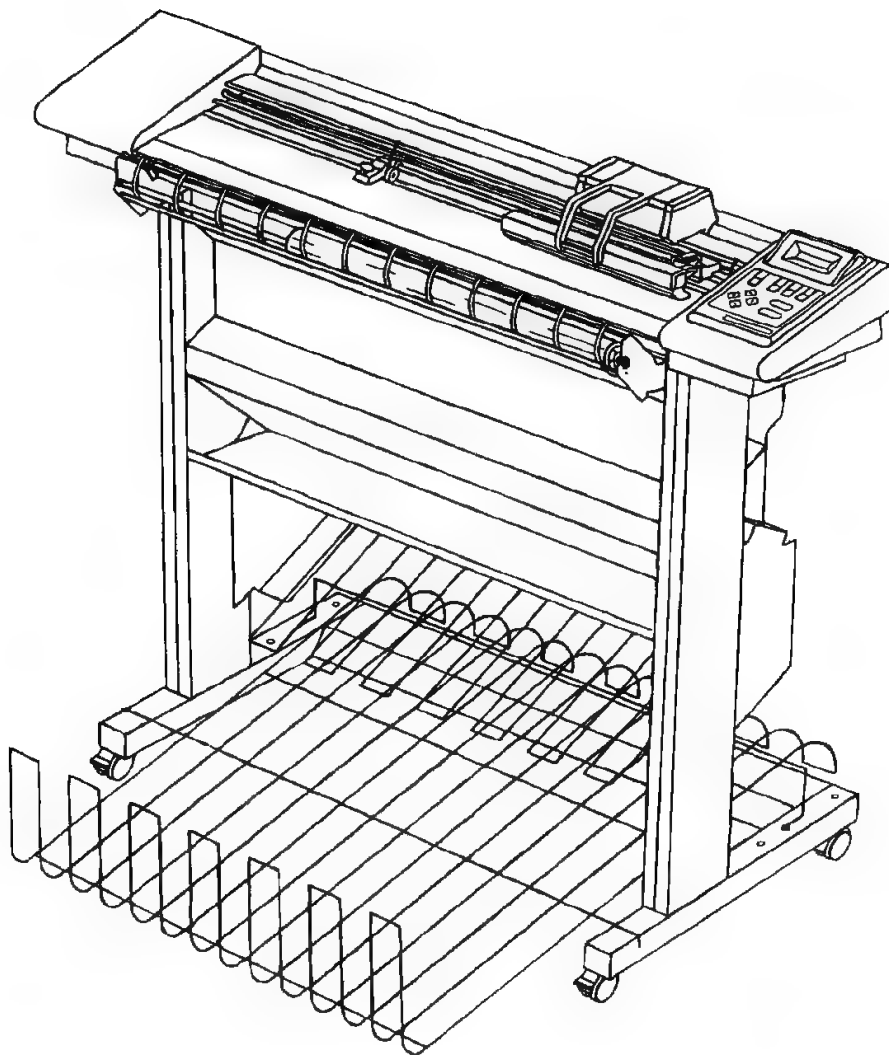
FIGURE 2–1(b). DMP-162R PLOTTER

2.4 ACCESSORIES

You can extend the features of your plotter with the following accessories. These accessories can be ordered from your Houston Instrument product dealer, or directly from Houston Instrument by calling toll free 1-800-776-9989 (512-873-1395).

● Larger buffer. Additional RAM (random access memory) is available to allow storing larger plot files and to more quickly release the host computer for other tasks while plotting continues.

The standard DMP-161 and DMP-162 plotters have 512 kilobytes of RAM; the standard DMP-162R plotter has 1 megabyte of RAM. This may be expanded to the amounts shown in Table 2–1 using the RAM Expansion Buffer Kit listed. You can verify the buffer size in your plotter by watching the LCD display during power on or plotting the SERVICE PLOT (Section 10).

TABLE 2–1. EXPANSION BUFFER KITS

KIT NUMBER	BUFFER SIZE
EB–1	1 megabytes
EB–2	2.5 megabytes
EB–4	4 megabytes

● Model 128 Series SCAN–CAD scanner. This accessory allows the plotter to function as a large–format scanner. See Figure 2–2. Installation and operating instructions for the scanner are provided with the accessory.
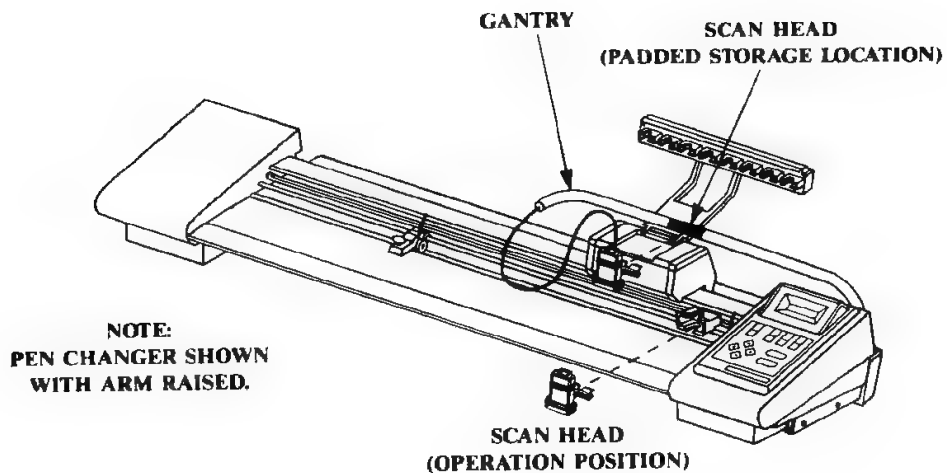
FIGURE 2–2. SCANNER ACCESSORY

2.5 OPERATING FEATURES

The plotter operator controls are shown in Figure 2–3. These are described below.

CHART
SIZE
MARKERS

LEFT
PINCH ROLLER
LEVER ARM

PEN
CHANGER

PEN
HOLDER

RIGHT
PINCH ROLLER
LEVER ARM

ADJUSTABLE
PINCH ROLLER

POWER
SWITCH

CONTROL
PANEL

RS-232-C
DATA
CONNECTOR

POWER
ENTRY
MODULE
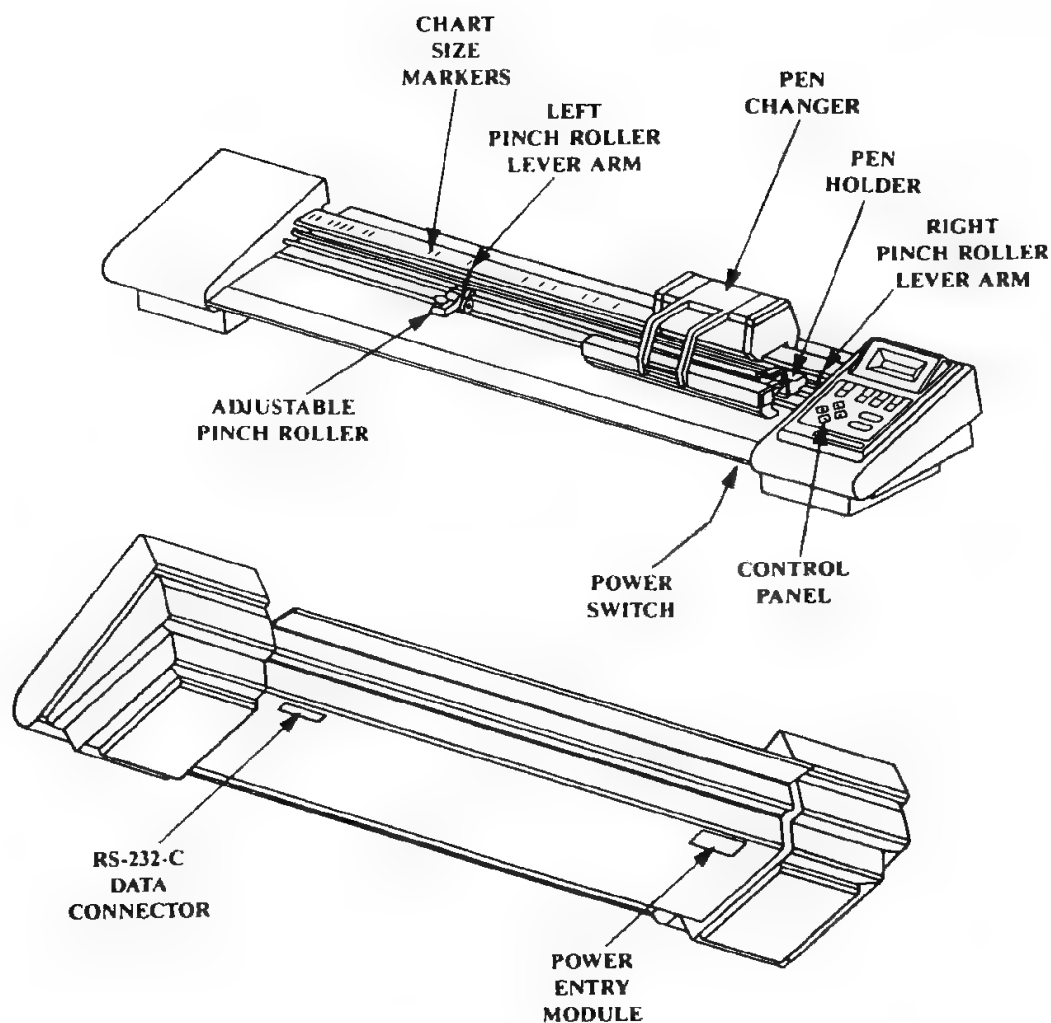
FIGURE 2–3. OPERATING FEATURES

- **RS–232–C data connector.** This standard DB–25P connector is where the data cable from the host computer is connected to the plotter. It provides RS–232–C serial communications between the plotter and host computer. Interface information is given in Appendix B.

- **Power entry module.** The power entry module is where the power cord attaches to the plotter. The power fuse and the operating voltage selection adjustment are located here. Refer to Paragraph 11.3 for fuse replacement and operating voltage conversion.

- **Power switch.** Plotter power is ON when this switch is pressed at the "|" symbol and OFF when pressed at the "O" symbol.

- **Control panel.** The control panel and keys are described in detail in Paragraph 2.6.

- **Pinch roller lever arms.** These are used to raise and lower the pinch rollers for chart loading. Chart loading is explained in Section 3.

- **Adjustable pinch roller.** The adjustable pinch roller is used to set the size for chart loading. The adjustable pinch roller is set at various positions on the platen to accommodate the different chart sizes. Chart size setting is explained in Section 3.

- **Chart size markers.** The chart size markers on top of the plotter indicate the various chart sizes available for that particular model. These are used as an easy reference when setting the adjustable pinch roller position. Chart size setting is explained in Section 3.

- **Pen holder.** The pen holder holds the pen presently being used for plotting. The pen may be inserted manually, or automatically when the pen changer is used. Pen loading is explained in Section 4.

- **Pen changer.** The MP–80 pen changer allows convenient multi–pen operation. Pen changing is controlled by the host plotting software. The changer may be configured for one– to eight–pen operation as described in Paragraph 7.17.

2.6   CONTROL PANEL

The plotter control panel is shown in Figure 2–4. The liquid crystal display and control panel keys are explained in the following paragraphs.

LCD
DISPLAY

NOTE:
ACTIVE AREA OF KEY
IS THE KEY LABEL.

KEYS

RESET
LOAD   ONLINE   MENU   ENTER

1 | 2

PEN
UP/DN | PEN
SELECT
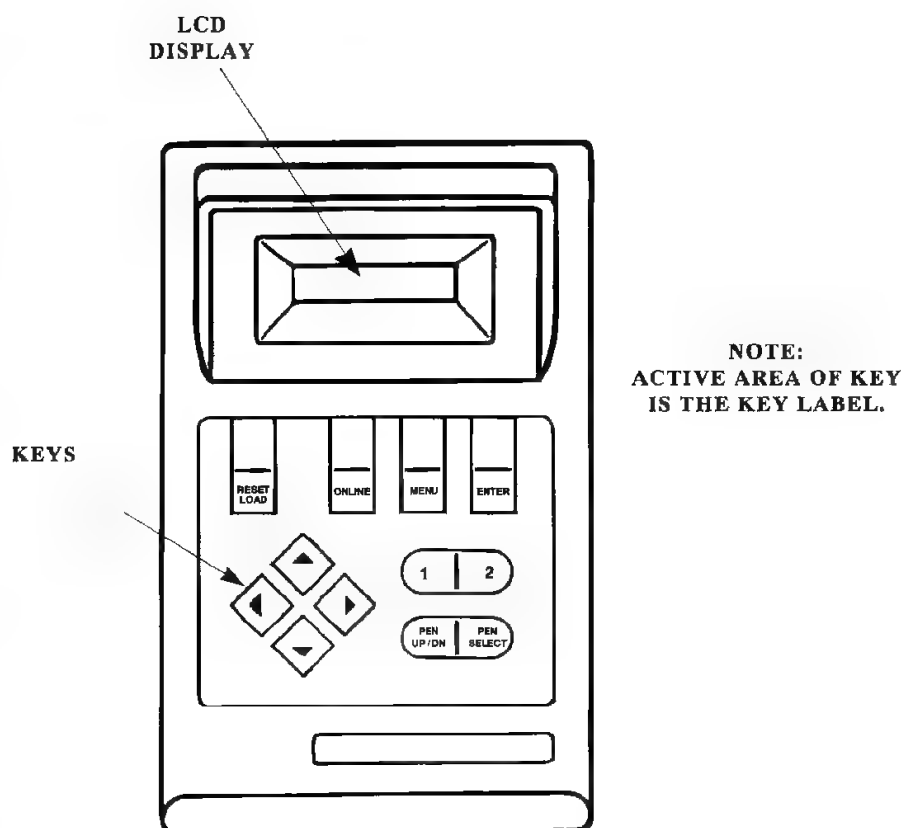
FIGURE 2–4. CONTROL PANEL

2.6.1   Liquid Crystal Display

The liquid crystal display (LCD) is organized into two rows of 16 characters each. The display intensity (brightness) is adjustable (as described in Section 6) so it can be read easily from various viewing angles.

2.6.2   RESET/LOAD Key

The **RESET/LOAD** key is used to LOAD a chart, ABORT the present plot, REPLOT the present plot, RESET the plotter, or CUT a roll chart (DMP-162R only). When this key is pressed, the plotter goes offline, suspends any other operation in progress, and displays the RESET/LOAD menu. Press the left arrow or right arrow key until the desired operation is displayed, then press the **ENTER** key. Upon completion, the plotter goes online.

LOAD is used to load a new chart, as described in Section 3. Any clip or scale features set by the operator on the control panel are maintained after a LOAD of the same chart size. The plot buffer data is also retained during a LOAD. Table A–2 lists the plotter parameters that are set as the result of a LOAD operation. However, if the chart size is changed by more than 0.1 inch (2.54 mm) in the pen axis or 1.0 inch (25.4 mm) in the chart axis, any clip, scale, and/or quick scale settings are cleared.

ABORT simply cancels the present plot in progress. It also retains the plotter parameters like a LOAD (as listed in Table A–2).

REPLOT is used to replot the last plot stored in the plotter's memory.

If a plot is not available for replot, the REPLOT message will not be displayed. This would occur when there is no plot file in the buffer, when the last–plotted file was too large to fit completely into the buffer, or when a plot file is in the buffer but the file has not yet started plotting (and therefore is not ready for a "replot"). Note that selecting RESET will clear the buffer, making the replot feature unavailable.

The following steps explain how to replot the plot code in the buffer.

1.   Press the **RESET/LOAD** key. Press the left arrow or right arrow key until REPLOT is displayed, then press the **ENTER** key to replot the data.

2.   The display will ask if you want a new chart. If you do, put a new chart in and press the **1** key. If you want to replot on the old chart, press the **2** key.

Note that the CLIPPING feature described in Paragraph 8.5, the SCALING feature described in Paragraph 8.6, and the QUICK SCALE feature described in Paragraph 8.4 can be used with the REPLOT feature, if so desired.

RESET performs a complete reset of the plotter. Any clip or scale features set by the operator on the control panel are cleared after a RESET. Table A–3 shows the plotter parameters that are set as the result of a RESET (the load parameters in Table A–2 are also set).

CUT is available for the DMP-162R plotter. When this option is selected, the present plot is cut from the roll; a load is not performed.

2.6.3   ONLINE Key

The **ONLINE** key toggles between online and offline operation. The present online or offline mode is displayed when this key is pressed. When set to offline, any other operation in progress is suspended. Pressing this key again returns to online, resuming the suspended operation. While offline, the plotter can be operated manually if so desired in the following manner:

●   Pressing the left arrow or right arrow key moves the pen left or right, while pressing the up arrow or down arrow key moves the chart in or out of the plotter. If no chart has been loaded, movement is restricted to Engineering A size.

● Pressing the **PEN SELECT** key accesses a menu to select a given pen from the pen changer. See Paragraph 2.6.9.

● Pressing the **PEN UP/DN** key lowers the pen and pressing it again raises the pen. See Paragraph 2.6.8.

● While offline, you can also set the P1 and P2 points as described in Paragraph 3.5 when HP-GL or HP-GL/2 is the active plotting language.

2.6.4   MENU Key

The **MENU** key is used to select among several menus that configure your plotter. When this key is pressed, the plotter is placed offline and any other operation in progress is suspended. Repeatedly pressing this key scrolls through the various menus. To select the displayed menu, press the **ENTER** key. To exit the menus and resume the previous online operation, press the **ONLINE** key. To exit the menus and load a new chart or reset the plotter, press the **RESET/LOAD** key and select the desired operation.

The various menus are summarized in Table 2–2 as a quick–reference guide to these menus. The menus are explained in detail in the appropriate Section. See Figure 2–5.

TABLE 2–2. MENU QUICK–REFERENCE

MENU	DESCRIPTION	REFERENCE SECTION
USER SELECT	Selects the active plotter configuration from one of four internally maintained sets of configuration parameters.	5
LCD CONTRAST	Adjusts the intensity of the liquid crystal display on the control panel.	6
CONFIGURATION	Accesses the various sub–menus to configure the plotter parameters.	7
CLIP & SCALE	Accesses the various sub–menus to select the plotter clip and scale features.	8
INTERNAL PLOTS	Plots various resident plots provided for informational purposes.	9
SERVICE MODE	Provides test and demonstration routines which can be initiated from the control panel.	10
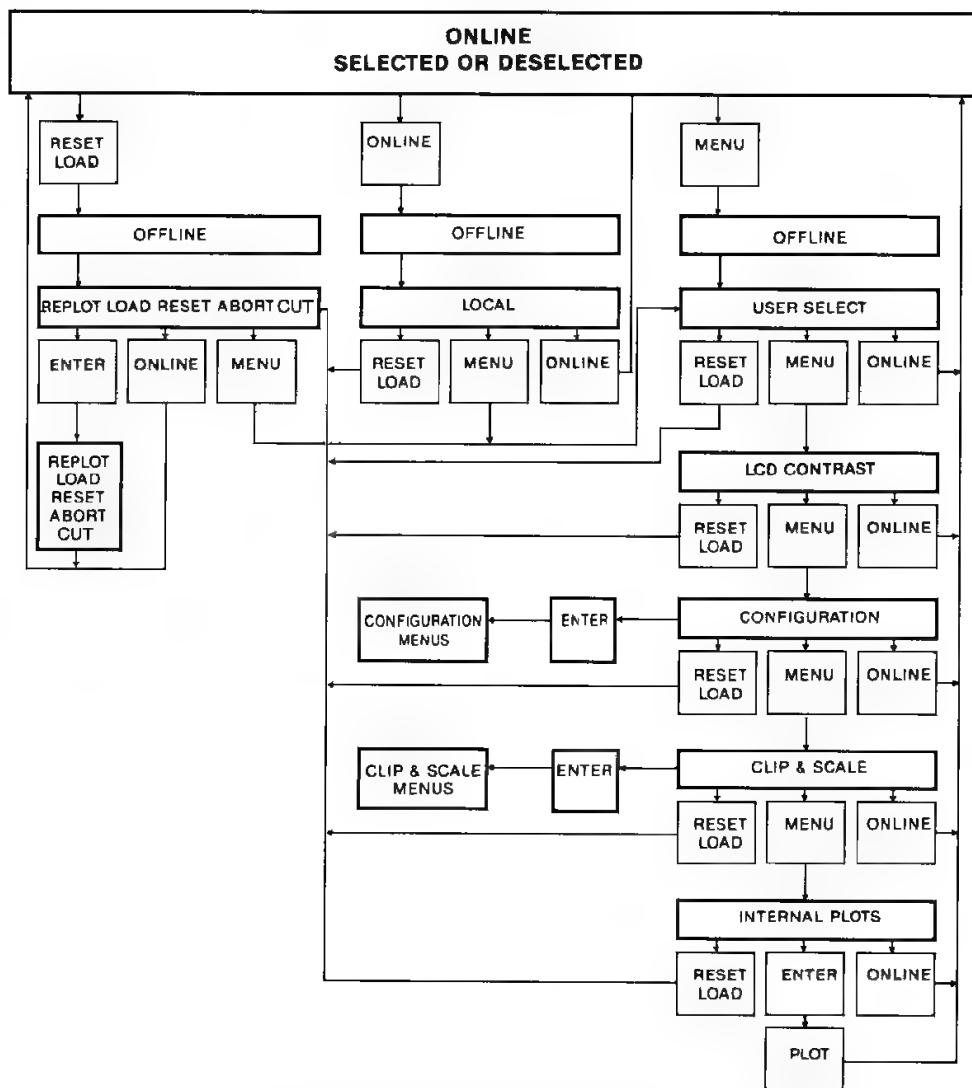
FIGURE 2–5. MENU STRUCTURE

2.6.5   ENTER Key

The **ENTER** key is used to select the presently displayed item. The **ENTER** key is also used to enter points while in digitizing mode (Paragraph 2.7.3).

2.6.6   1 And 2 Keys

The **1** key and **2** key usage varies according to the present operation.

When the HP-GL or HP-GL/2 plotting language is used, the **1** and **2** keys are used to select P1 and P2 points (see Paragraph 3.5).

Some error messages display a choice of responses. Use the **1** or **2** key to select a choice.

2.6.7   Arrow Keys

The use of the left arrow, right arrow, up arrow, and down arrow keys varies according to the presently active operation.

2.6.8   PEN UP/DN Key

The **PEN UP/DN** key is used while offline to manually control the pen up/down state. When pressed once, the pen is lowered to the chart. When pressed again, the pen is raised. Note that if the pen is not moved for approximately eight seconds, it is automatically raised to prevent ink from bleeding on the chart. It automatically resumes its down position when the pen is moved. If the pen is not moved for the period set in the AUTO–CAPPING menu (Paragraph 7.22), it is automatically returned to its pen changer stall to prevent drying. It automatically returns to the previous position on the chart if one of the arrow keys is pressed.

2.6.9 PEN SELECT Key

While offline, pressing the **PEN SELECT** key accesses a menu to select a given pen from the pen changer. Press the left arrow or right arrow key until the desired pen number is displayed, then press the **ENTER** key. If a pen is not selected in this menu, the plotter automatically uses pen 1 if the **PEN UP/DN** key is pressed while operating locally offline. The PEN VELOCITY and PEN TIP SIZE menus also use this key to index to the desired pen.

2.7 NORMAL OPERATION

The term "normal operation" simply refers to using the plotter for online, offline, digitizing, clipping, and scaling operations. These are explained in the following paragraphs.

2.7.1 Online Operation

During online operation, the plotter responds to host computer plotting commands by moving the pen and the chart as necessary to draw the plot. During online operation the plotter displays ONLINE. Additionally, in online operation, the plotter will display SELECTED or NOT SELECTED depending on whether the plotter has received a select command from the host.

Pressing the **RESET/LOAD, ONLINE,** or **MENU** key will place the plotter in offline mode as described in the next paragraph. To return to online mode from offline mode, press the **ONLINE** key. The plotter is online if, and only if, ONLINE is displayed.

2.7.2 Offline Operation

Unless the plotter displays ONLINE, the plotter is in offline mode. When the plotter changes from online to offline mode, any present plotting action is suspended until the plotter is returned to online mode.

Offline mode may be entered by pressing the **RESET/LOAD, ONLINE,** or **MENU** key. Press **ONLINE** to return to online mode.

While offline, certain plotter functions may be operated manually:

- Pressing the left arrow or right arrow key moves the pen carriage left or right.

- Pressing the up arrow or down arrow key moves the chart forward or backward.

- Pressing the **PEN UP/DN** key changes the pen state. An "up" pen will be lowered, a "down" pen will be raised.

- Pressing the **PEN SELECT** key displays a menu to select the active pen.

- Only when the plotting language is HP-GL or HP-GL/2, pressing the **1** or **2** key moves to the present P1 or P2 point on the chart.

2.7.3 Digitizing

The plotter has a digitizing feature in which it can be commanded to transmit the present pen position to the host computer during a plotting session. This is selected by software control from the host computer while the plotter is online and selected. This feature is used to "read" existing positional information from a chart. For example, you could load a map into the plotter, then digitize specific points from it upon command from the host computer software.

When DM/PL is active, the plotter displays DIGITIZE: ENTER when it receives a Digitize command from the host computer. The plotter automatically selects local mode. Use the left arrow, right arrow, up arrow, and down arrow keys to position the pen to the desired location on the chart. Press the **ENTER** key to send the position to the host computer. The plotter then resumes normal operation (ONLINE and SELECTED).

When HP-GL or HP-GL/2 is active, the plotter displays DIGITIZE REQUEST when it receives a Digitize Point command from the host computer. Press the ONLINE key to select local mode. The plotter then displays DIGITIZE: ENTER. Use the left arrow, right arrow, up arrow, and down arrow keys to position the pen to the desired location on the chart. Press the **ENTER** key to enter the position. The plotter then resumes normal operation (ONLINE and SELECTED).

2.7.4   Clipping And Scaling

You can alter the size of a plot and its location on the chart using the clipping and scaling features.

To simply scale a plot larger or smaller than normal while maintaining the correct aspect ratio, it is recommended that you use the QUICK SCALE menu described in Paragraph 8.4. To scale a plot larger or smaller than normal and alter the aspect ratio, use the SCALE menu described in Paragraph 8.6.

To "clip" (plot only a portion) a plot, use the CLIP menu described in Paragraph 8.5.

Note that these clipping and scaling features can be used with the replot feature for convenience.

SECTION 3
CHARTS

3.1 INTRODUCTION

This section provides information for using cut sheet charts on the DMP-161, DMP-162, and DMP-162R plotters and roll charts on the DMP-162R plotter. This information includes chart size setting, cut sheet chart loading, roll chart loading, supplies, and environmental considerations.

Charts, pens, pen care products, pen storage containers, and other Houston Instrument–approved supplies are available from your Houston Instrument product dealer, or direct from Houston Instrument by calling toll free 1-800-776-9989 (512-873-1395).

3.2 CHART SIZE SETTING

The following steps explain how to set a particular chart size for the plotter.

1.   Raise the left pinch roller arm. See Figure 3–1.

2.   Loosen the thumbscrew (counterclockwise) on the adjustable pinch roller.

3.   Position the adjustable pinch roller so that the thumbscrew is aligned with the chart size marker that matches your chart size. Insert the thumbscrew into the corresponding threaded hole on the platen, then tighten the thumbscrew (clockwise).

Note that the anti–static brushes on the front and rear edges of the platen do not actually touch the chart during normal operation. This is intentional. For proper anti–static protection, these brushes MUST NOT touch the chart.

The pinch roller lever arms must be left in the "up" position when the plotter is powered off and not in use. This prevents a flat spot from being temporarily impressed on the resilient pinch roller wheels, which may result in temporary tracking errors.

CHART
SIZE
MARKERS

LEFT PINCH
ROLLER LEVER
ARM

RIGHT PINCH
ROLLER LEVER
ARM

THUMBSCREW

ADJUSTABLE
PINCH ROLLER
DETAIL

THREADED
HOLE
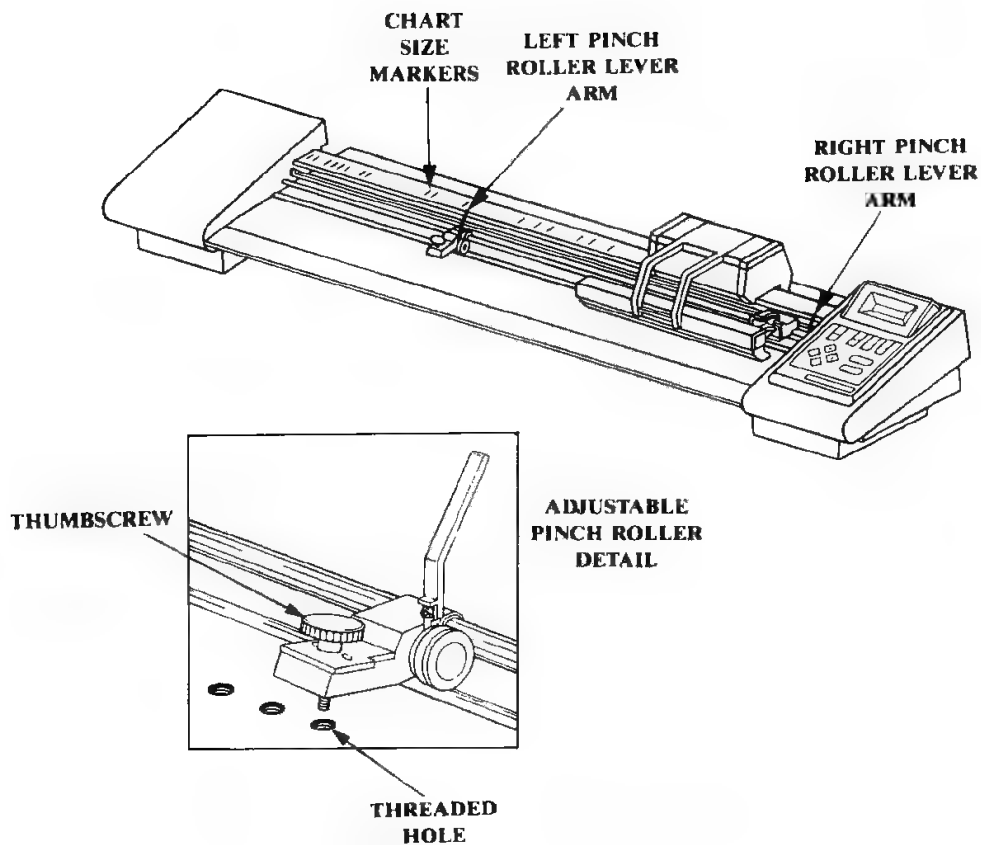
FIGURE 3–1. CHART SIZE SETTING

Table 3-1 lists the standard chart sizes and the plotter chart size marker to be used for each. Observe that the DMP-162 and DMP-162R models have extra size settings to handle undersize charts. Note that most marker positions accommodate two standard sizes which are referred to as full size and half size.

Charts that are of non–standard front–to–back dimension may be used if the dimension is between 8 and 50 inches (203.3 and 1270mm). The plotter will sense the dimension automatically and set standard margins as described below. Note that tracking of chart lengths greater than 50 inches (1270mm) is not guaranteed—this applies to both cut–sheet and roll media plots. The DMP-162R rollfeed system also was designed to work with drawings no longer than 50 inches. Longer drawings may not stack correctly in the wireform basket.

All sizes of cut sheet charts have the same margins. The right and left margins are nominally 0.6 inch (15.2 mm) each. The front margin is nominally 0.95 inch (24.1 mm). The rear margin is nominally 0.25 inch (6.3 mm). All sizes of roll charts also have the same margins. The right, left, front, and rear margins are nominally 0.6 inch (15.2 mm) each. See Figure 3-2. See Table 3-2 for the plotting areas available for each standard chart size.

The charts for your plotter are packaged in protective wrapping. After opening the package and removing the chart, let smaller cut sheet charts sit for at least 15 minutes before using, larger cut sheet charts for at least one hour, and roll charts for at least 72 hours. This allows the charts to stabilize to the surrounding humidity. If not allowed to stabilize to the environment before use, the resulting plot may have mismatched lines, line shifts, or offsets. This is a result of the chart expanding and contracting during plotting. For proper operation, do not use curled charts. Handle the chart by its edges only; fingerprints leave a slight residue on the chart, which may cause the pens to skip over those areas.

TABLE 3–1. DMP-160 STANDARD CHART SIZES

CHART SIZE MARKER	HALF SIZE CHART		FULL SIZE CHART	
FOR DMP-161 & DMP-162 & DMP-162R:				
A–B Size	Engineering A	8.5x11 inches	Engineering B	11x17 inches
A4–A3 DIN	DIN A4	210x297 mm	DIN A3	297x420 mm
12"	Architectural A	9x12 inches	Architectural B	12x18 inches
OVERSIZE A4–A3	Oversize DIN A4	240x330 mm	Oversize DIN A3	330x450 mm
C–D SIZE	Engineering C	17x22 inches	Engineering D	22x34 inches
A2–A1 DIN	DIN A2	420x594 mm	DIN A1	594x841 mm
24"	Architectural C	18x24 inches	Architectural D	24x36 inches
OVERSIZE A2–A1	Oversize DIN A2	450x625 mm	Oversize DIN A1	625x880 mm
FOR DMP-162 & DMP-162R:				
B1 DIN	—		DIN B1	707x1000 mm
28"	Architectural/Engineering F	28x40 inches	—	
30" *	—		Architectural	30x42 inches
30" **	—		Architectural	30x42 inches
A0 DIN *	—		DIN A0	841x1189 mm
A0 DIN **	—		DIN A0	841x1189 mm
E SIZE *	—		Engineering E	34x44 inches

TABLE 3–1. DMP-160 STANDARD CHART SIZES
(Continued)

FOR DMP-162 & DMP-162R:		
E SIZE **	—	Engineering E 34x44 inches
OVERSIZE A0 *	—	Oversize DIN A0 880x1230 mm
OVERSIZE A0 **	—	Oversize DIN A0 880x1230 mm
36" *	—	Architectural E 36x48 inches
36" **	—	Architectural E 36x48 inches

NOTES:

* Undersize.
** Standard size.

LEFT MARGIN
0.6 INCH (15.24 MM)

REAR MARGIN
0.25 INCH (6.35 MM)

MAXIMUM
PLOT AREA

RIGHT MARGIN
0.6 INCH (15.24 MM)

FRONT MARGIN
0.95 INCH (24.13 MM)

DMP-161 & DMP 162

LEFT MARGIN
0.6 INCH (15.24 MM)

REAR MARGIN
0.6 INCH (15.24 MM)

MAXIMUM
PLOT AREA

RIGHT MARGIN
0.6 INCH (15.24 MM)

FRONT MARGIN
0.6 INCH (15.24 MM)

DMP-162R
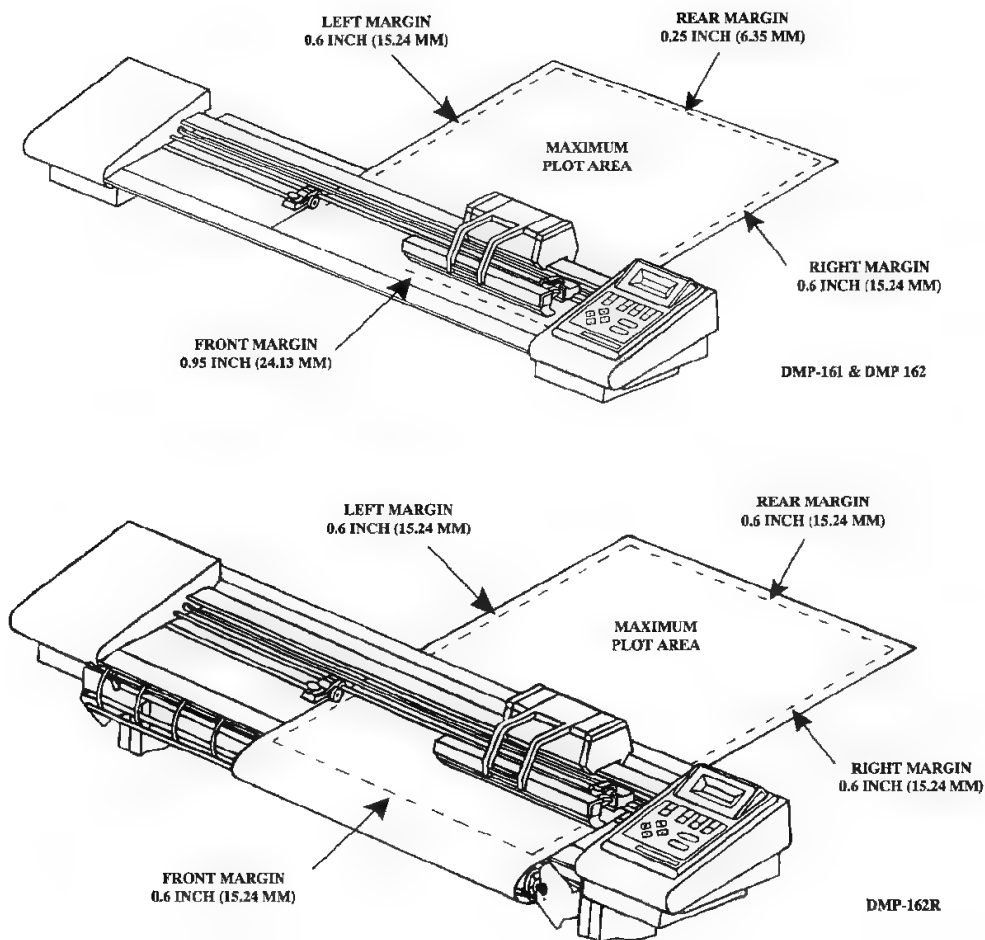
FIGURE 3–2. CHART MARGINS

TABLE 3–2. MAXIMUM PLOTTING AREAS

CHART SIZE	PLOT AREA
Engineering A	7.3 x 9.8 inches
Engineering B	9.8 x 15.8 inches
Engineering C	15.8 x 20.8 inches
Engineering D	20.8 x 32.8 inches
Engineering E *	32.5 x 42.5 inches
Engineering E **	32.8 x 42.8 inches
Engineering F	26.8 x 38.8 inches
Architectural A	7.8 x 10.8 inches
Architectural B	10.8 x 16.8 inches
Architectural C	16.8 x 22.8 inches
Architectural D	22.8 x 34.8 inches
Architectural E *	34.5 x 46.5 inches
Architectural E **	34.8 x 46.8 inches
Architectural F	26.8 x 38.8 inches
Architectural 30 x 42 *	28.5 x 40.5 inches
Architectural 30 x 42 **	28.8 x 40.8 inches
DIN A4	179 x 266 mm
DIN A3	266 x 389 mm
DIN A2	389 x 563 mm
DIN A1	563 x 810 mm
DIN A0 *	802 x 1150 mm
DIN A0 **	810 x 1158 mm
DIN B1	676 x 969 mm

NOTES:

* Undersize.
** Standard size.

TABLE 3–2. MAXIMUM PLOTTING AREAS
(Continued)

CHART SIZE	PLOT AREA
Oversize DIN A4	209 x 299 mm
Oversize DIN A3	299 x 419 mm
Oversize DIN A2	419 x 594 mm
Oversize DIN A1	594 x 849 mm
Oversize DIN A0 *	841 x 1191 mm
Oversize DIN A0 **	849 x 1199 mm

NOTES:

* Undersize.
** Standard size.

3.3   CUT SHEET CHART LOADING

WARNING

To prevent personal injury when operating the plotter, keep your hands,
hair, and clothing away from the platen, chart drive shaft, pen carriage,
and cutting mechanism (DMP-162R).

For the DMP-162R plotter, it is important that the CHART FEED menu described in
Paragraph 7.14 be set for CUT SHEET in order to load cut sheet charts. Place the media
guide wireform and wireform basket in their storage positions when using cut sheet charts
in the plotter.

The following steps explain how to load a cut sheet chart in the plotter.

1.   Set the power switch on (1).

2.   Raise the left and right pinch roller arms. See Figure 3–1.

3.   Slide the cut sheet chart under both pinch rollers. Carefully adjust the chart so that its right edge aligns with but does not cover the line on the right side of the platen. Align the front edge of the chart with the groove on the front of the platen. See Figure 3–3. Lower both pinch roller arms to secure the chart in the plotter.

4.   Press the control panel **RESET/LOAD** key one time. Notice that LOAD is displayed on the control panel. Press the **ENTER** key to load a chart. The plotter moves the pen carriage left to find the width of the chart, moves the chart out to find its length, and shuffles it to set the pinch roller tracks.

Selecting RESET from the RESET/LOAD menu performs a complete reset of the plotter, but does not load a chart. Loading a chart that differs by more than 0.1 inch (2.54 mm) in the pen axis or 1.0 inch (25.4 mm) in the chart axis from the previous chart clears any clip, scale, or quick scale in effect when a LOAD is attempted. Selecting ABORT or REPLOT from the RESET/LOAD menu will allow you to load a new chart if the old chart was marked. Refer to Paragraph A.3.

If the plotter detects a longer than standard size chart during a load, it displays the OVERSIZE CHART? prompt. If you wish to place a standard size plot on the chart, select NO. The plotter will select the next smaller standard size chart, not using the excess front–to–back length. If you select YES, the plotter will use the full detected length, up to 20 feet (6 m).

GROOVE

LINE

CHART

ALIGN WITH
PLATEN LINE

ALIGN WITH
PLATEN GROOVE
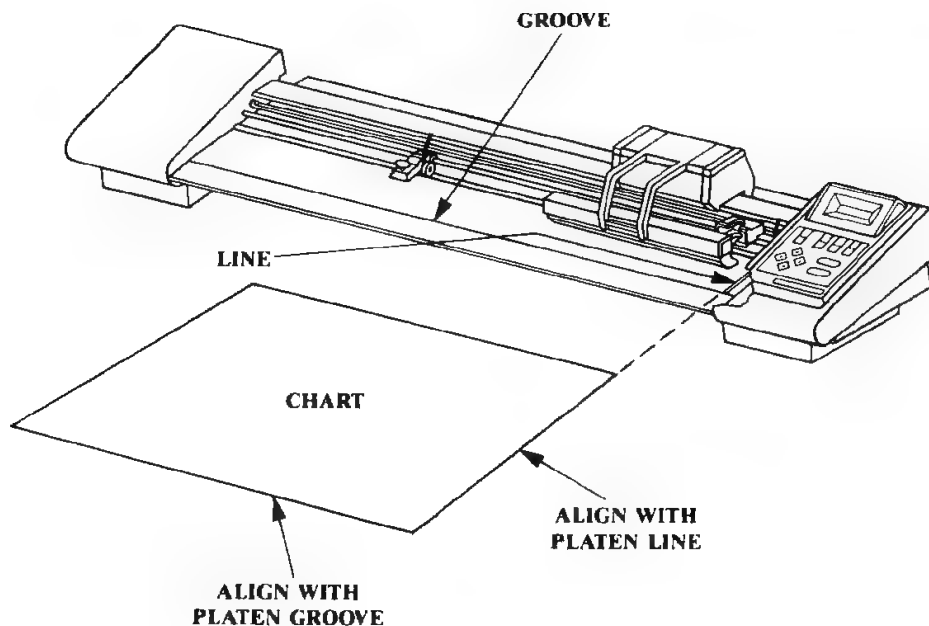
FIGURE 3–3. CUT SHEET CHART LOADING

3.4 ROLL CHART LOADING ON DMP-162R

WARNING

To prevent personal injury when operating the plotter, keep your hands, hair, and clothing away from the platen, chart drive shaft, pen carriage, and cutting mechanism (DMP-162R).

NOTE

Park the cutter carriage before moving the DMP-162R. To park the cutter blade power up the plotter and allow it to initialize itself. When ROLL NOT LOADED appears on the display, you may power down the plotter and move it without damaging the unit.

3.4.1   Configuring The Plotter For Roll Mode

There are four CHART FEED modes for the DMP-162R: CUT SHEET, FULL ROLL, HALF ROLL, and MANUAL ROLL. For rollfeed operation select a roll mode using the plotter's CONFIGURATION menu. (See Paragraph 7.14.)

3.4.2   Roll Loading

1.   Position the media guide wireform and wireform basket.

        Make sure the media guide wireform is in its storage position. Also make sure the wireform basket is in its correct position for the size of media you are loading, D position for a D-size roll chart, or E position for an E-size roll chart. See Figure 3–4.

2.   Check the roll.

        Before loading, check the reference end of the roll — the end that will be nearest the plotter's control panel when the roll is mounted. It is important that this end be smooth and undamaged. The edges of all chart layers at this end should form a flat, circular surface. Refer to Paragraph 3.4.4 for more information on storing and checking your rolls.

3.   Load roll onto shaft assembly.

Note the orientation of the roll as shown in Figure 3-4. Remove the shaft assembly from the plotter and free the removable endcap assembly. Slide the roll onto the shaft assembly, taking care that the O-rings on the captive end cap assembly are not disturbed. Push the roll and core onto the end cap. Now slide the removable end cap assembly onto the shaft. Using pressure on both end caps, push the end caps into the core until the roll is flush against the flange of each end cap — this is important for proper frame advance operation.

4.   Place shaft assembly with roll onto plotter.

Holding the shaft assembly with the roll approximately parallel to the rear of the plotter, slide the end caps fully into the notches in the brackets. See Figure 3-4. Note that the left end cap must be properly oriented to mate with its notch.

CAUTION

Do not unroll more chart material than necessary from the roll. Chart material that has been rewound on the roll may not track properly during a succeeding frame advance.

5.   Feed media into the plotter.

Place the media guide wireform in its upper position. Feed the end from the roll around the outside of the guide, over the platen, and under the pinch rollers. See Figure 3-5.

Hold the end near the center of the back edge and gently pull taut. Still pulling gently, find a left–to–right position that is neutral. The chart will tend to resist being pulled to the left or right. Check that the chart extends beyond both pinch rollers and then lower the pinch rollers to hold the chart in position.

NOTE

The plotter must be set to a rollfeed mode before proceeding. If this has
not been done, refer to Paragraph 3.4.1.

6. Load a chart.

    Press the control panel **RESET/LOAD** key one time. Notice that LOAD is
    displayed on the control panel. Press the **ENTER** key to load a chart. The plotter
    moves the pen carriage left to find the width of the chart.

    The plotter moves the leading edge of the roll past the media cutter and prompts
    CUT or CONTINUE. If you select CUT, the media cutter cuts off the leading edge
    of the media and drops it. You can adjust the amount to be cut by using the up
    arrow and down arrow keys. If you select CONTINUE, the existing edge is used.

    The plotter pulls a full size chart from the roll.

    When DM/PL is the plotting language, the length is displayed in inches or
    millimeters according to the MENU UNITS (see Paragraph 7.21). For HP-GL or
    HP-GL/2, the length is always displayed in millimeters. Press the **ENTER** key to
    continue.

    A LOAD DELAY (see Paragraph 7.15) occurs to allow the media to stabilize,
    after which the plotter shuffles the chart to set the pinch roller tracks and then is
    ready to plot. If LOAD DELAY is displayed, you may press the ONE key to cut
    short the delay and continue the LOAD.

    Subsequent loads will automatically cut off the previous plot and drop it into the
    basket. Loading a chart that differs by more than 0.1 inch (2.54 mm) in the pen axis
    or 1.0 inch (25.4 mm) in the chart axis from the previous chart clears any clip,
    scale, or quick scale settings when a load is attempted.

3.4.3 Roll Chart Cutting

To cut a roll chart without loading a new chart, press the **RESET/LOAD** key. Press the left arrow or right arrow key until CUT is displayed. Press the **ENTER** key.
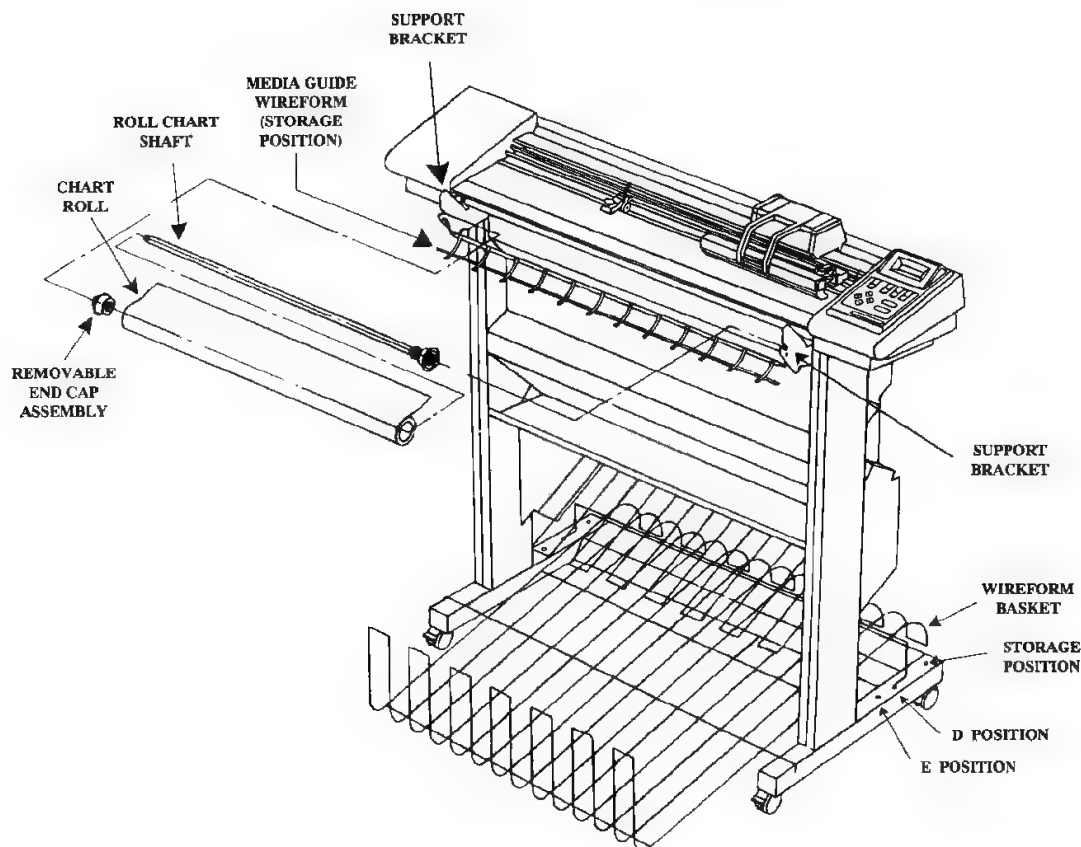
FIGURE 3-4. ROLL INSTALLATION

PINCH ROLLER ARM

PLATEN

ROLL CHART

MEDIA GUIDE
WIREFORM
(UPPER POSITION)

MEDIA GUIDE
WIREFORM
(STORAGE POSITION)
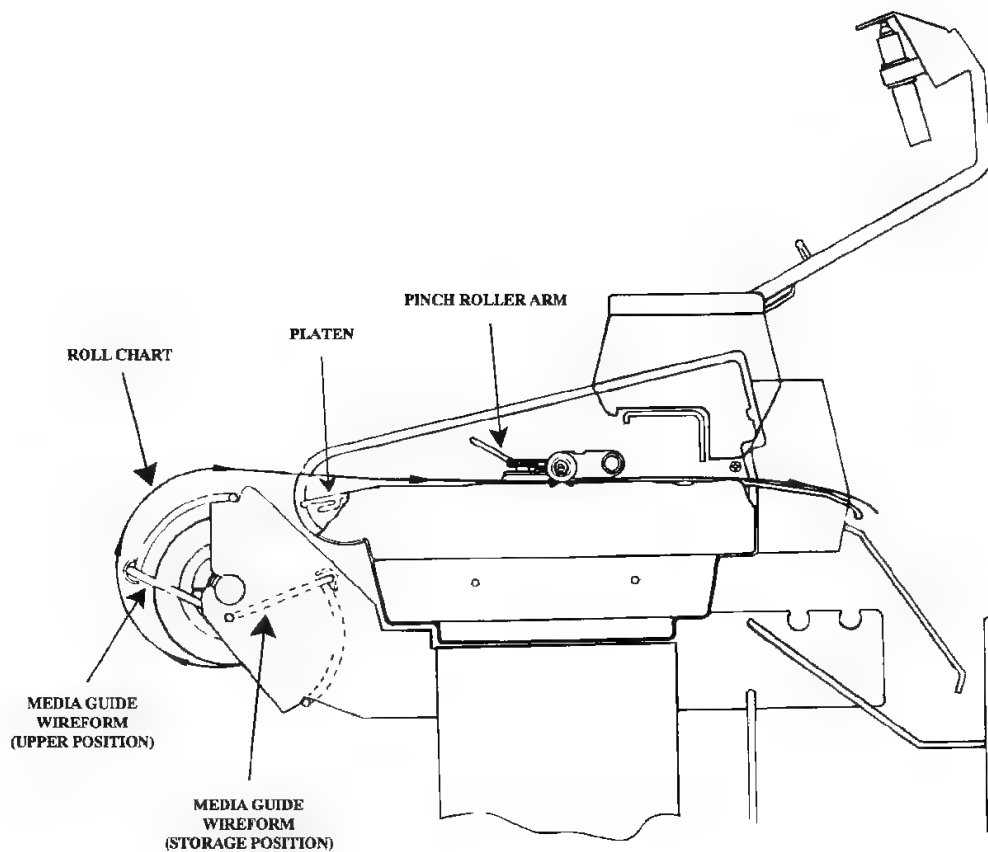
FIGURE 3-5. ROLL CHART LOADING

3.4.4 Roll Chart Recommended Handling

Keep in mind the following precautions when using roll charts:

- Maintain a constant environment during plotting. Changes in temperature and, especially, relative humidity can produce significant changes in chart dimensions (the chart can expand or contract). If chart dimensions change during a plot, mistracking is a likely result. In minor cases, loss of accuracy and a failure to overplot may be noticed. In extreme cases, tracking may be lost completely, leading to torn and damaged plots.

- Allow all charts to stabilize to the plotter environment prior to plotting. A roll chart, inherently many layers thick on the core, is slow to stabilize. If the roll has not been stored in the plotter environment, allow it to "rest" in the plotter environment for at least 72 hours prior to plotting. Protective wrappings must be removed from rolls to allow them to stabilize.

- If you encounter tracking problems. set the LOAD DELAY to 4–5 minutes. You will need to experiment with different delay times to best fit your media and environment. (See Paragraph 7.15)

- Use only Houston Instrument-approved charts for best results. Although other brands can be used, proper performance can be guaranteed only with Houston Instrument supplies. Never use mylar media on a DMP-162R plotter.

- Use care when storing and loading charts to avoid damage to the chart. Before loading, check the reference end of the roll the end — that will be nearest the plotter's control panel when the roll is mounted. It is important that this end be smooth and undamaged. The edges of all paper layers at this end should form a flat, circular surface.

- After shipping or after the roll has undergone a change in environment, especially relative humidity, the reference end of the roll may no longer be flat. A flat end can sometimes be restored by tapping the reference end of the roll against a smooth, hard surface — but be careful not to damage the edges. Also, it is recommended that open rolls be stored upright, resting on the reference end; this will help maintain a flat reference end.

•   Avoid wrinkles or creases in the chart, especially during the loading process. Wrinkles and creases can cause mistracking and damage to the plot. Avoid disturbing the air (for example, walking quickly nearby) near the loop that hangs from the plotter during a plot. Air currents can cause wrinkles and creases. Wrinkles form easily in some environmental conditions. Reducing the plotter speed usually helps avoid wrinkles, but it also reduces throughput.

3.5   PLOT ORIGIN AND AXES ORIGIN

A plot origin and an axes origin are established when a chart is loaded. These determine how the plotting software orients the plot on the chart. Typically, plots are oriented left to–right along the long axis of the chart.

The plotter sizes a chart when it is loaded and sets a plot origin of either NORMAL (x–axis is the long axis) or ROTATED (y–axis is the long axis), according to the ORIENTATION menu setting (Paragraph 7.24).

DM/PL, HP-GL, or HP-GL/2 is selected in the LANGUAGE menu as the active plotting language (Paragraph 7.19). These plotting languages use the Cartesian coordinate system as a reference for plotting purposes. For each language and each chart orientation, an origin of 0,0 is set for the x–axis and the y–axis. These vary as explained in the following paragraphs.

When DM/PL is the active plotting language, the axes origin corresponds to the plot origin as shown in Figure 3–6. The origin 0,0 is in the corner of the chart and all absolute coordinates are positive from that point.

NORMAL HALF SIZE CHART
OR
ROTATED FULL SIZE CHART
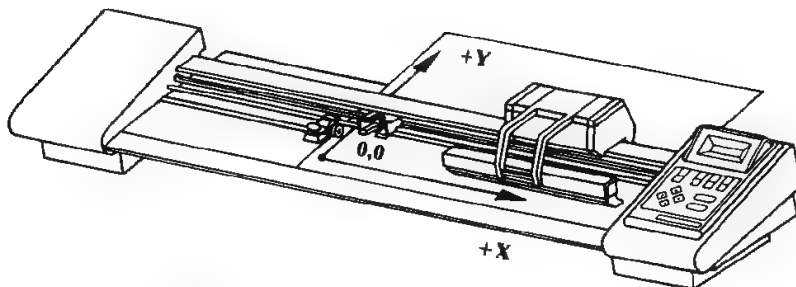
NORMAL FULL SIZE CHART
OR
ROTATED HALF SIZE CHART
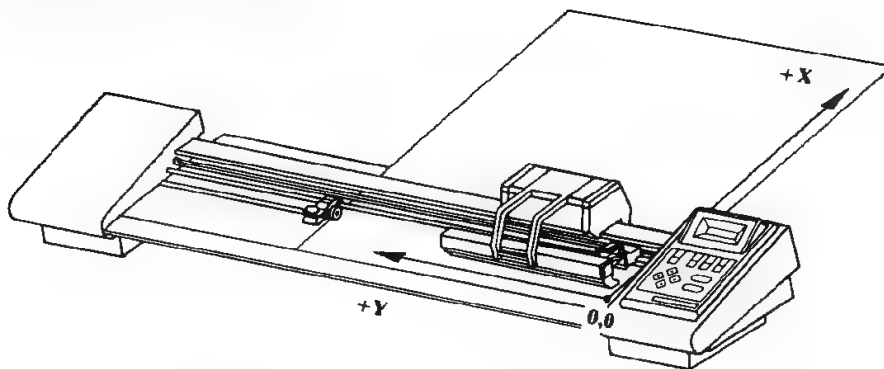
FIGURE 3–6. DM/PL AXES ORIGIN

When HP-GL is the active plotting language, the axes origin is oriented to the plot origin as shown in Figure 3–7. The origin 0,0 is in the center of the chart and all absolute coordinates are positive or negative from that point.

NORMAL HALF SIZE CHART
OR
ROTATED FULL SIZE CHART
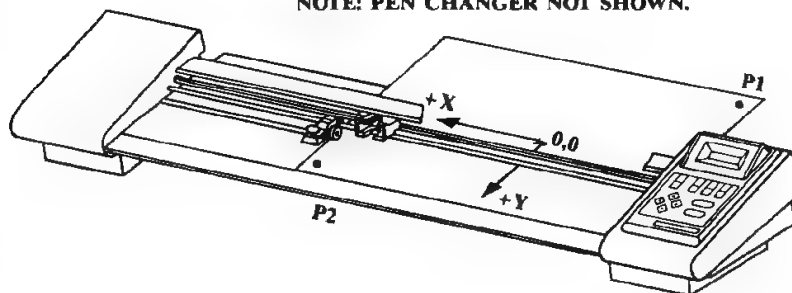
NORMAL FULL SIZE CHART
OR
ROTATED HALF SIZE CHART
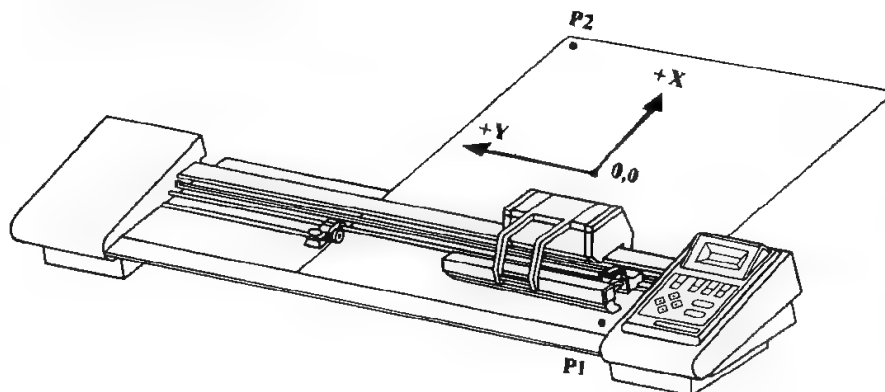
FIGURE 3–7. HP-GL AXES ORIGIN

When HP-GL/2 is the active plotting language, the axes origin corresponds to the plot origin as shown in Figure 3–8. The origin 0,0 is in the corner of the chart and all absolute coordinates are positive from that point.

NORMAL HALF SIZE CHART
OR
ROTATED FULL SIZE CHART
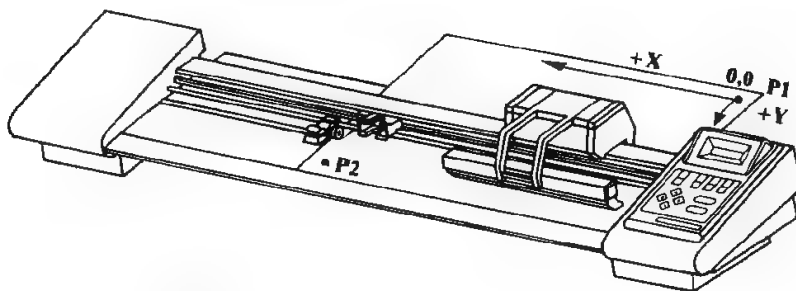
NORMAL FULL SIZE CHART
OR
ROTATED HALF SIZE CHART
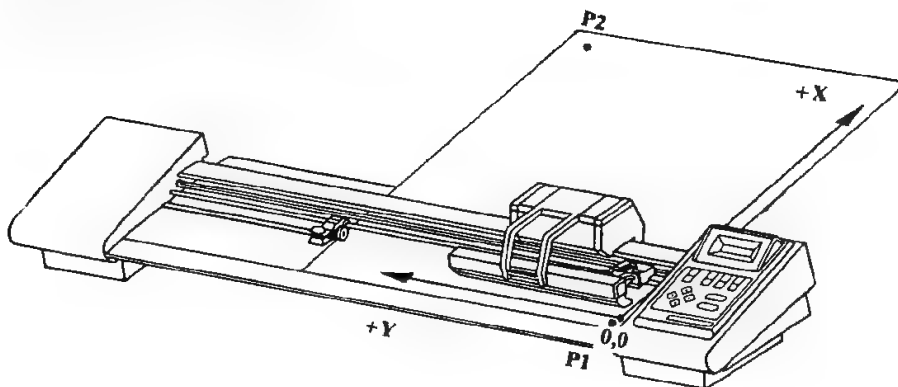
FIGURE 3–8. HP-GL/2 AXES ORIGIN

When HP-GL is selected as the active language, the default P1 and P2 locations are 15 mm (600 HP-GL plotter units) in from the corners of the plot area as shown in Figure 3–7. When HP-GL/2 is selected as the active language, the default P1 and P2 locations are at the corners of the plot area as shown in Figure 3–8.

You can change the locations of the P1 and P2 points as described in the following steps. However, you would typically do this only if P1 and P2 operations are supported by the host plotting software. P1 and P2 provide plot control similar to the SCALE LL and SCALE UR points described in Section 8.

1.   Load a chart and pens.

2.   Press the **ONLINE** key for offline (local) operation.

3.   Press the **1** key to go to the present P1 point. At the SET P1 menu, use the left arrow, right arrow, up arrow, and down arrow keys to position the pen to the new P1 point, then press the **ENTER** key. To cancel the request to set a new P1 point, press the **1** key BEFORE pressing the **ENTER** key.

4.   Press the **2** key to go to the present P2 point. At the SET P2 menu, use the left arrow, right arrow, up arrow, and down arrow keys to position the pen to the new P2 point, then press the **ENTER** key. To cancel the request to set a new P2 point, press the **1** key BEFORE pressing the **ENTER** key.

5.   Press the **ONLINE** key to resume online operation and use the new P1 and P2 points with the plotting software.

6.   To cancel the custom P1 and P2 points and restore the default locations, press the **RESET/LOAD** key one time. Press the left arrow or right arrow key until RESET is displayed, then press the **ENTER** key.

3.6   CHART SUPPLIES

Houston Instrument offers three basic types of chart materials: film, vellum, and bond paper.

Film includes Single–Matte Film (a polyester material), Clear Coated Film (an aqueous–coated material), and Clear Acetate Film. Single–Matte Film is useful for archival plots and plots which must maintain dimensional accuracy despite changes in temperature and humidity during storage. Clear Coated Film is overhead transparency film that has a special coating for fast ink drying times. It is designed for use with water–based ink pens. Clear Acetate Film is an overhead transparency film that is designed for use with pens that have solvent–based inks.

Premium Plus Vellum is made of a resin impregnated cotton–based cloth material. It is subject to size changes due to temperature and humidity factors (Paragraph 3.7). Premium Plus Vellum is suitable for high quality final plots and is excellent for all reproduction methods.

Bond Paper includes Glossy Presentation Bond (high gloss finish), Matte Presentation Bond (low gloss finish), and Translucent Bond. These are subject to size changes due to temperature and humidity factors (Paragraph 3.7). Matte Presentation Bond and Glossy Presentation Bond are used for business graphics, while Translucent Bond is used for check plots. Translucent Bond is an economical substitute for vellum and can be used to produce good quality reproductions.

Tables 3–3 through 3–9 list the various chart types and sizes available for use with your plotter. These can be ordered from your Houston Instrument product dealer, or direct from Houston Instrument by calling toll free 1-800-776-9989 (512-873-1395). Be sure to note the environmental and compatibility considerations listed in Paragraphs 3.7 and 4.5 before ordering or loading charts.

TABLE 3–3. SINGLE–MATTE POLYESTER FILM

SIZE		PART NUMBER	QUANTITY
Engineering C	17 x 22 inches	MC–3340	100 sheets
Architectural C	18 x 24 inches	MC–3339	100 sheets
Engineering D	22 x 34 inches	MC–3338	100 sheets
Architectural D	24 x 36 inches	MC–3337	100 sheets
Engineering E	34 x 44 inches	MC–3334	50 sheets
Architectural E	36 x 48 inches	MC–3336	50 sheets
Architectural	30 x 42 inches	MC–3335	50 sheets

TABLE 3–4. CLEAR COATED FILM
(FOR WATER–BASED INKS)

SIZE		PART NUMBER	QUANTITY
Engineering A	8.5 x 11 inches	MC–3233	50 sheets

TABLE 3–5. CLEAR ACETATE FILM
(FOR SOLVENT–BASED INKS)

SIZE		PART NUMBER	QUANTITY
Engineering A	8.5 x 11 inches	MC–3098	100 sheets
Engineering B	11 x 17 inches	MC–3195	50 sheets

TABLE 3–6. PREMIUM PLUS VELLUM

SIZE		PART NUMBER	QUANTITY
CUT SHEET:			
Engineering A	8.5 x 11 inches	MC–3355	100 sheets
Engineering B	11 x 17 inches	MC–3354	100 sheets
Engineering C	17 x 22 inches	MC–3353	100 sheets
Engineering D	22 x 34 inches	MC–3352	100 sheets
Architectural D	24 x 36 inches	MC–3351	100 sheets
Architectural	30 x 42 inches	MC–3357	100 sheets
Engineering E	34 x 44 inches	MC–3356	100 sheets
Architectural E	36 x 48 inches	MC–3350	100 sheets
ROLL:			
24 inches		MC–3296	60 feet
24 inches		MC 3299	150 feet
36 inches		MC–3300	60 feet
36 inches		MC–3301	150 feet

TABLE 3–7. GLOSSY PRESENTATION BOND

SIZE		PART NUMBER	QUANTITY
Engineering A	8.5 x 11 inches	MC–3346	100 sheets
Engineering B	11 x 17 inches	MC–3345	100 sheets
Engineering C	17 x 22 inches	MC–3344	100 sheets
Engineering D	22 x 34 inches	MC–3343	100 sheets
Architectural D	24 x 36 inches	MC–3342	100 sheets
Architectural E	36 x 48 inches	MC–3341	100 sheets

TABLE 3–8. MATTE PRESENTATION BOND

SIZE		PART NUMBER	QUANTITY
Engineering A	8.5 x 11 inches	MC–3332	100 sheets
Engineering B	11 x 17 inches	MC–3333	100 sheets
Engineering C	17 x 22 inches	MC–3359	100 sheets
Engineering D	22 x 34 inches	MC–3360	100 sheets
Architectural D	24 x 36 inches	MC–3361	100 sheets
Architectural	30 x 42 inches	MC–3363	100 sheets
Architectural E	36 x 48 inches	MC–3362	100 sheets

TABLE 3–9. TRANSLUCENT BOND

SIZE		PART NUMBER	QUANTITY
CUT SHEET:			
Engineering A	8.5 x 11 inches	MC–3347	100 sheets
Engineering B	11 x 17 inches	MC–3348	100 sheets
Engineering C	17 x 22 inches	MC–3349	100 sheets
Engineering D	22 x 34 inches	MC–3269	100 sheets
Architectural D	24 x 36 inches	MC–3270	100 sheets
Architectural	30 x 42 inches	MC–3329	100 sheets
Engineering E	34 x 44 inches	MC–3330	100 sheets
Architectural E	36 x 48 inches	MC–3331	100 sheets
ROLL:			
24 inches		MC–3320	60 feet
24 inches		MC–3314	150 feet
36 inches		MC–3321	60 feet
36 inches		MC–3313	150 feet

3.7 ENVIRONMENTAL CONSIDERATIONS

Figure 3–9 shows the recommended operating range for all sizes of film, and for vellum and bond paper chart sizes Engineering A and B; Architectural A and B; DIN A4 and A3; and Oversize DIN A4 and A3.

Figure 3–10 shows the recommended operating range for vellum and bond paper chart sizes Engineering C, D, E, and F; Architectural C, D, E, F, and 30x42 inches; DIN A2, A1, A0, and B1; Oversize DIN A2, A1, and A0.

It is important to remember that vellum and bond paper charts expand and contract with changes in humidity and temperature. This effect may be especially noticeable with larger chart sizes. For best results, remove each chart from the packaging and allow it to stabilize to the plotting environment before use. For Engineering C size or smaller cut sheet charts, allow 15 minutes; for larger cut sheet charts, allow one hour; and for roll charts, allow 72 hours. Use of unstabilized charts may result in poor plot quality and repeatability, such as unmatched or shifted lines.

If the plotting media is being used in an extreme operating condition, you may have to load the larger size charts differently than explained previously. The following paragraph explains how.

Under normal operating conditions, a chart should be positioned so that its right edge aligns with but does not cover the line on the right side of the platen and its front edge aligns with the groove on the front of the platen as shown in Figure 3-3. However, if the chart has contracted, you may need to center the chart between both pinch rollers so that the pinch roller wheels make contact with both edges of the chart. If the chart has expanded, you must move the chart to the right so that it does not make contact with the adjustable pinch roller assembly during chart movements.
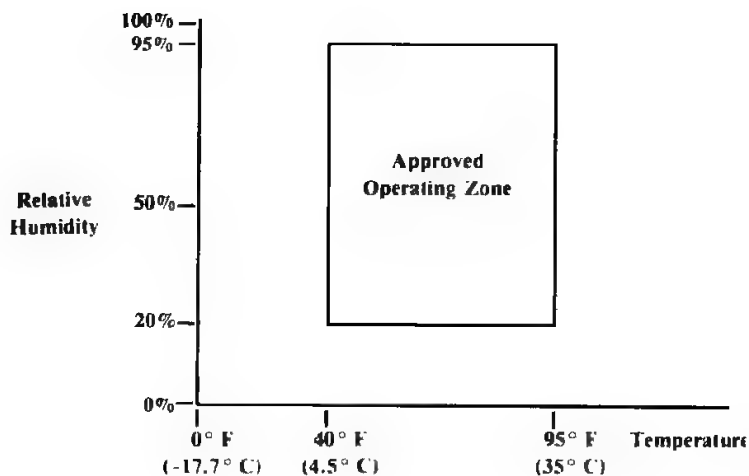
FIGURE 3–9. OPERATING RANGE FOR ALL FILM AND SMALL CUT SHEET CHART PAPER
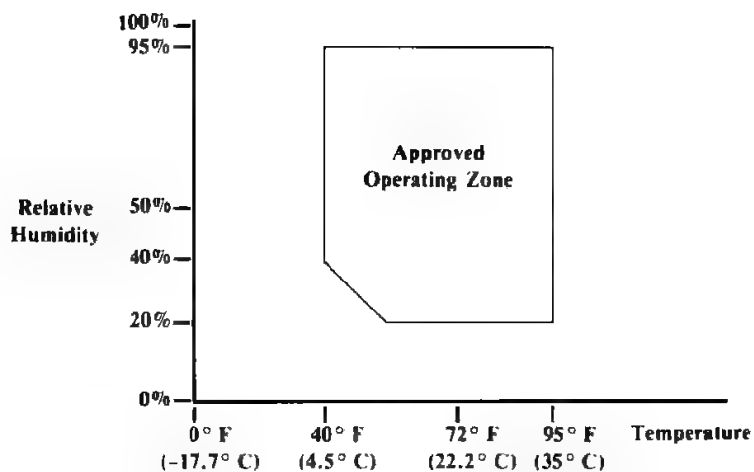
FIGURE 3–10. OPERATING RANGE FOR LARGE CUT SHEET
CHART PAPER AND VELLUM

SECTION 4
PENS

4.1 INTRODUCTION

This section provides information for using pens with your plotter. This includes pen care, loading, supplies, and compatibility considerations.

Pens, pen care products, pen storage containers, charts, and other Houston Instrument–approved supplies are available from your Houston Instrument product dealer, or direct from Houston Instrument by calling toll free 1-800-776-9989 (512-873-1395).

4.2 PEN CARE

The pens used with the plotter are durable marking pens specially designed for plotter graphics. The following paragraphs describe the simple care requirements for these plotter pens. Follow these general guidelines for all pen types:

- All plotter pen types must be capped when not in actual use.

- Drafting pens may be kept in the self–sealing pen stalls on the pen changer for short–term storage. Note that fiber–tip (hard nib) and roller ball pen types are **NOT** effectively sealed in the pen changer pen stalls.

- For long–term storage of fiber–tip or roller ball pens, store the pens by removing them from the plotter, capping them with the provided caps, and sealing them in a plastic bag.

  For disposable paper pens, store them capped in a vertical position with the tip up.

  For disposable film pens, store them capped in a vertical position with the tip down.

  For refillable pens, clean the pens and store them empty.

- All pens should be checked for ink flow before use by testing them on an appropriate chart sample.

4.2.1 Ceramic Pen

Ceramic pens (Figure 4–1) offer convenience and quality while providing more writing distance than standard disposable pens. Ceramic–tip pens provide excellent results with bond paper and vellum. These pens are maintenance–free and can be left uncapped for extended periods of time.
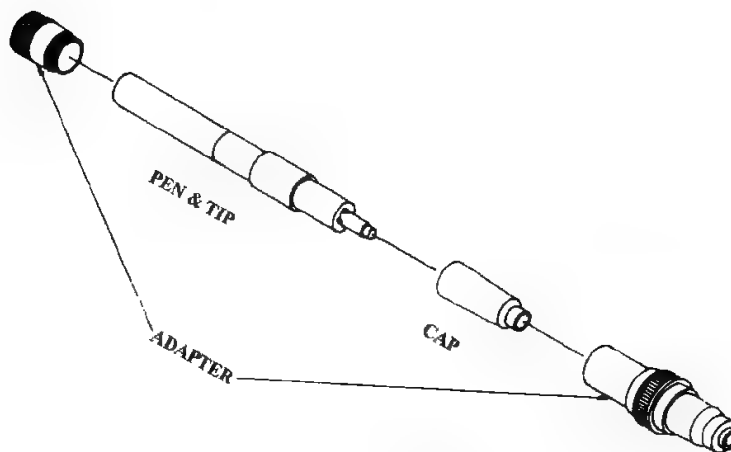
FIGURE 4–1. CERAMIC PEN

4.2.2 Disposable Paper Pen Or Disposable Film Pen

Disposable Paper pens and Disposable Film pens (Figure 4–2) are technical drafting pens that have no particular care requirements other than to keep them capped when not in actual use. Cap the pen with the short blue cap if the pen is inserted in an adaptor. Otherwise, cap the pen with the long clear cap. These pens are automatically sealed when installed in the pen changer pen stalls. Paper and film pens need to be stored with the tips up.

Disposable Paper pens and Disposable Film pens are offered in standard and long–body configurations. The long–body pens are especially suited for lengthy technical plotting applications, offering twice the writing distance of the standard body pens.

PEN   TIP   CAP   ADAPTOR

FIGURE 4–2. DISPOSABLE PAPER PEN
OR DISPOSABLE FILM PEN

BEFORE FIRST USE, the Disposable Paper pens or Disposable Film pens **MUST** be activated. To do this for an assembled pen, simply press downward on the pen cap to break the internal ink seal. Hold the pen tip downward and gently shake the pen until ink flow is visible in the outer grooves. Test the pen on a piece of scrap plotting material to verify operation. Then install an adaptor on the pen body for use in the plotter.

Disposable Paper pens are used with Premium Plus Vellum for final plots, and with Translucent Bond paper for good quality check plots. Disposable Film pens are used with Single–Matte Film for archive quality plots, and with Premium Plus Vellum for final plots.

Disposable Film pens work equally well on Single–Matte Film and Premium Plus Vellum. However, it is recommended that these pens be used only on one chart type for the life of the pen to obtain the best plot quality and prevent possible chart damage.

Other than occasionally wiping the pen tip to remove any fiber build–up, there are no special cleaning requirements for these pens. A Disposable Paper pen, Disposable Film pen, or Refillable Tungsten pen with dried ink can often be restarted by holding the pen point upward and sharply tapping the reservoir against a hard surface several times. Capping a dried pen for a few days may allow the ink to dissolve the clog. Also, these pens can often be restarted by dipping the pen point in water or an ultrasonic cleaner, then rubbing the point on scrap vellum.

4.2.3 Refillable Tungsten Pen Or Refillable Paper Pen

Refillable Tungsten pens are technical drafting pens for plots on Premium Plus Vellum, Translucent Bond, or Single–Matte Film. Refillable Paper pens are technical drafting pens with stainless steel tips to produce high quality plots on Premium Plus Vellum and Translucent Bond. See Figure 4–3. These pens should be capped when not in actual use. The pens are automatically sealed when installed in a stable of the pen changer. Like any technical drawing pen, these pens must be occasionally cleaned and filled with ink for proper operation. Store these pens empty after cleaning them.

FILL
LINE

RING   LONG INK RESERVOIR   BODY   TIP   CAP   ADAPTOR

SHORT INK RESERVOIR
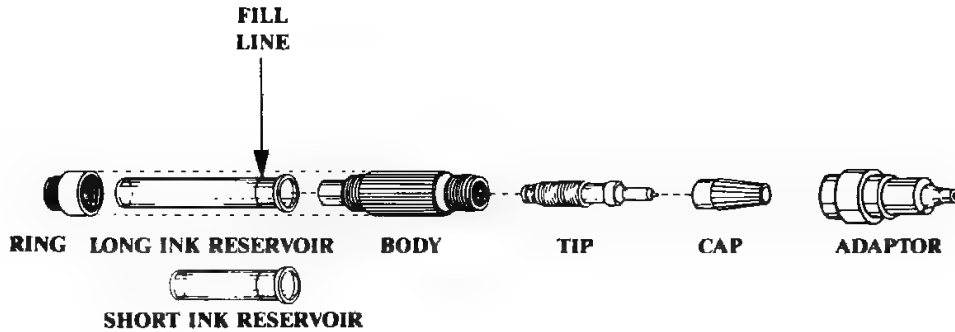
FIGURE 4–3. REFILLABLE TUNGSTEN PEN
OR REFILLABLE PAPER PEN

To fill the pen, remove the pen reservoir and add ink up to the fill line (Figure 4–3). For best results, do not fill past this line. Also note that these pens should be refilled before the reservoir is empty. To start the flow of ink, turn the pen point downward and gently tap the top of the reservoir. Test the pen on a piece of scrap plotting material to verify operation. Then install an adaptor on the pen body for use in the plotter. Never shake the pen, since this may cause the ink to clog the air vents and prevent the flow of ink.

CAUTION

If the pen tip is taken apart, be very careful not to bend the cleaning wire inside the tip.

For best results, remove the ink reservoir and thoroughly clean the pen tip after each use with an ultrasonic drafting pen cleaner and solution. Wash the reservoir in tap water. Then thoroughly dry the parts and reassemble the pen. Note that you should thoroughly clean a pen if you plan to use another ink color in it.

Pen care products can be ordered directly from Houston Instrument by calling toll free 1-800-776-9989 (512-873-1395). An Ultrasonic Cleaner (part number MC–2200), Pressure Bulb Cleaning Kit (part number MC–2199), and Cleaning Solution with Strainer (part number MC–78) are available specifically for use with these refillable pens.

Refillable Tungsten pens are used with Single–Matte Film for archive quality plots, and with Premium Plus Vellum for final plots. With proper care, these abrasion–resistant pens last almost indefinitely.

A Refillable Tungsten pen or Refillable Paper pen with dried ink can sometimes be restarted by dipping the pen point in water or denatured alcohol, then rubbing the point on scrap plotting media.

4.2.4 Fiber–Tip Pen Or Roller Ball Pen

Fiber–tip pens or roller ball pens (Figure 4–4) are disposable pens that have no particular care requirements other than to keep them capped when not in actual use. These pens should be removed and capped after plotting because they are not effectively sealed in the pen changer pen stalls. Test the pen on a piece of scrap plotting material to verify operation.

PEN   CAP
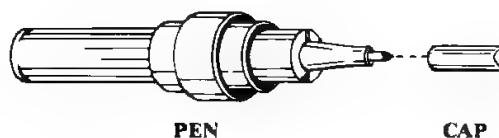
FIGURE 4–4. FIBER–TIP PEN OR ROLLER BALL PEN

Roller ball pens are useful for generating high speed check plots with Glossy Presentation Bond, Matte Presentation Bond, and Translucent Bond. Fiber–tip (water–based) pens are used with Clear Coated Film for overhead transparencies, Glossy Presentation Bond for business graphics, or Translucent Bond for check plots. Fiber–tip (solvent–based) pens are used with Clear Acetate Film (uncoated) for overhead transparencies and Single–Matte Film for final plots requiring reproduction and archival storage. No adaptor is needed with these pens.

A fiber–tip pen with dried ink can sometimes be saved by dipping the pen point in water, then rubbing the point on scrap paper to restart ink flow.

4.3   PEN LOADING

The following steps explain how to load any type of pen into the plotter.

1.   Remove the pen cap from the pen.

2.   Rub the pen point on an appropriate scrap piece of chart material to verify pen operation.

3.   A pen is installed by pressing the wide part into the jaws of the changer pen stall. See Figure 4–5. Install pens in stalls 1 through 8 of the pen changer, and leave the plotter pen holder empty. The pen changer arm must be down and latched for proper multi–pen operation. Place pens in the stalls by pen tip width and/or ink color according to your plotting software

The plotter can also be operated without the pen changer for single pen use. Either raise the pen changer arm or remove the pen changer and reset the plotter. Install a pen in the plotter pen holder. While configured for single pen use, the PEN PAUSE menu (Paragraph 7.23) can be used to produce multi–pen plots, if so desired.
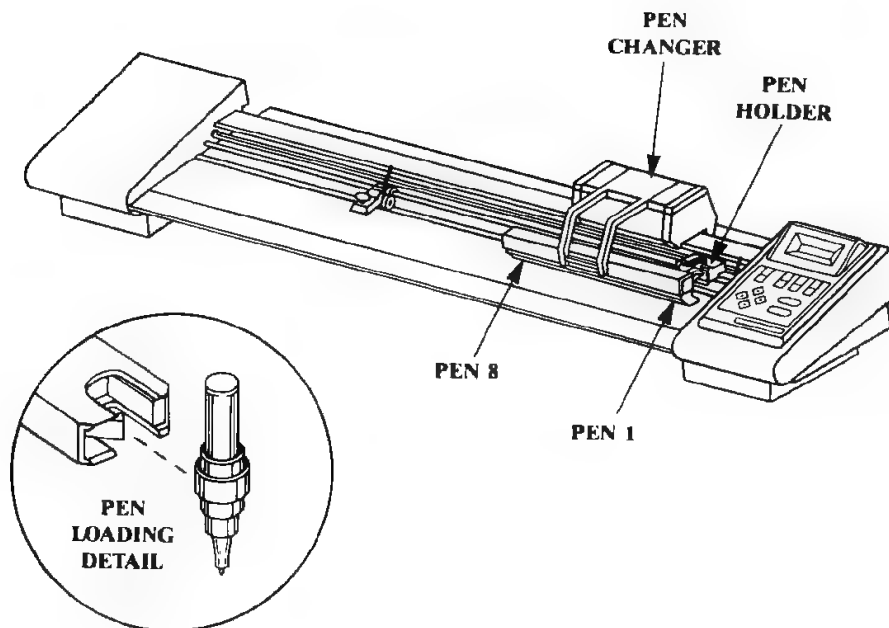
FIGURE 4–5. PEN INSTALLATION

4.4 PEN SUPPLIES

Tables 4–1 through 4–9 list the various pens, inks, adaptors, and caps available for use with your plotter. These can be ordered from your Houston Instrument product dealer, or direct from Houston Instrument by calling toll free 1-800-776-9989 (512-873-1395). Be sure to note the compatibility considerations given in Paragraph 4.5 before ordering or loading pens. Note that adaptors are required for the ceramic or drafting pens. Adaptors are not required for fiber–tip or roller ball pens.

TABLE 4–1. CERAMIC PENS

INK COLOR	EXTRA FINE (0.25 MM) PART NO.	FINE (0.35 MM) PART NO.	MEDIUM (0.50 MM) PART NO.	BROAD (0.70 MM) PART NO.	QUANTITY
INDIVIDUAL PENS:					
Black	MP–952	MP–956	MP–960	MP–964	4 each
Red	MP–953	MP–957	MP–961	MP–965	4 each
Blue	MP–954	MP–958	MP–962	MP–966	4 each
Green	MP–955	MP–959	MP–963	MP–967	4 each
KITS:					
Black, red, blue, green	MP–969	MP–970	MP–971	MP–972	1 each
Black	* MP–968	* MP–968	* MP–968	* MP–968	1 each
ADAPTORS:					
Adaptor	** MP–8189	** MP–8189	** MP–8189	** MP–8189	2 each

NOTES:

* MP–968 includes one of each tip width.
** MP–8189 includes two reusable adaptors.

TABLE 4–2. DISPOSABLE PAPER PENS (STANDARD BODY)

INK COLOR	EXTRA FINE (0.25 MM) PART NO.	FINE (0.35 MM) PART NO.	MEDIUM (0.50 MM) PART NO.	BROAD (0.70 MM) PART NO.	QUANTITY
INDIVIDUAL PENS:					
Black	MP–983	MP–919	MP–1043	MP–926	2 each
Red	MP–984	MP–917	MP–1045	MP–924	2 each
Blue	MP–985	MP–918	MP–1044	MP–925	2 each
Green	MP–986	MP–920	MP–1046	MP–927	2 each
Violet	N/A	MP–921	N/A	MP–928	2 each
Turquoise	N/A	MP–922	N/A	MP–929	2 each
Magenta	N/A	MP–923	N/A	MP–930	2 each
Yellow	N/A	MP–1042	N/A	MP–1047	2 each
KITS:					
Black, red, blue, green	N/A	MP–8097	N/A	N/A	1 each
Black, red, blue, green, violet, turquoise, magenta	N/A	* MP–8103	N/A	* MP–8103	1 each

NOTES:

* MP–8103 includes one each of 0.35 mm and 0.70 mm tip widths, 14 adaptors, 14 pen caps.

TABLE 4–2. DISPOSABLE PAPER PENS (STANDARD BODY)
(Continued)

INK COLOR	EXTRA FINE (0.25 MM) PART NO.	FINE (0.35 MM) PART NO.	MEDIUM (0.50 MM) PART NO.	BROAD (0.70 MM) PART NO.	QUANTITY
ADAPTORS:					
Adaptor, pen cap	** MP–8186	** MP–8186	** MP–8186	** MP–8186	2 each

NOTES:

** MP–8186 includes two reusable adaptors and two pen caps.

TABLE 4–3. DISPOSABLE PAPER PENS (LONG–BODY)

INK COLOR	EXTRA FINE (0.25 MM) PART NO.	FINE (0.35 MM) PART NO.	MEDIUM (0.50 MM) PART NO.	BROAD (0.70 MM) PART NO.	QUANTITY
INDIVIDUAL PENS:					
Black	MP–1010	MP–1018	MP–1026	MP–1034	2 each
Red	MP–1011	MP–1019	MP–1027	MP–1035	2 each
Blue	MP–1012	MP–1020	MP–1028	MP–1036	2 each
Green	MP–1013	MP–1021	MP–1029	MP–1037	2 each
Violet	MP–1015	MP–1023	MP–1031	MP–1039	2 each
Turquoise	MP–1016	MP–1024	MP–1032	MP–1040	2 each

TABLE 4–3. DISPOSABLE PAPER PENS (LONG–BODY)
(Continued)

INK COLOR	EXTRA FINE (0.25 MM) PART NO.	FINE (0.35 MM) PART NO.	MEDIUM (0.50 MM) PART NO.	BROAD (0.70 MM) PART NO.	QUANTITY
INDIVIDUAL PENS :					
Magenta	MP–1017	MP–1025	MP–1033	MP–1041	2 each
Yellow	MP–1014	MP–1022	MP–1030	MP–1038	2 each
KITS:					
Black, red, blue, green	PK–8116	PK–8126	PK–8135	PK–8146	1 each
Yellow, violet, turquoise, magenta	PK–8117	PK–8191	PK–8136	PK–8197	1 each
ADAPTORS:					
Adaptor, pen cap	* MP–8186	* MP–8186	* MP–8186	* MP–8186	2 each

NOTES:

* MP–8186 includes two reusable adaptors and two pen caps.

TABLE 4–4. DISPOSABLE FILM PENS

INK COLOR	EXTRA FINE (0.25 MM) PART NO.	FINE (0.35 MM) PART NO.	MEDIUM (0.50 MM) PART NO.	BROAD (0.70 MM) PART NO.	QUANTITY
INDIVIDUAL PENS:					
Black	PK–8171	PK–8172	PK–8173	PK–8174	4 each
Red	N/A	PK–8175	PK–8176	PK–8203	4 each
Blue	N/A	PK–8199	PK–8177	PK–8202	4 each
Green	N/A	PK–8200	PK–8201	PK–8178	4 each
ADAPTORS:					
Adaptor, pen cap	* MP–8186	* MP–8186	* MP–8186	* MP–8186	2 each

NOTES:

* MP 8186 includes two reusable adaptors and two pen caps.

TABLE 4–5. REFILLABLE PENS

ITEM	EXTRA FINE (0.25 MM) PART NO.	FINE (0.35 MM) PART NO.	MEDIUM (0.50 MM) PART NO.	BROAD (0.70 MM) PART NO.	QUANTITY
PEN BODY:					
Pen	* MP–602	* MP–602	* MP–602	* MP–602	1 each
INDIVIDUAL TIPS:					
Tungsten	MP–951	MP–659	MP–660	MP–661	1 each
Stainless steel	MP–997	MP–998	MP–999	MP–1000	1 each

NOTES:

* MP–602 includes one long and one short reservoir, two caps, and two adaptors.

TABLE 4–6. INK FOR REFILLABLE PENS

COLOR	PART NO.	DRYING TIME	OPEN PEN TIME	INK TYPE	RECOMMENDED MEDIA
Black	MI–288	fast	short	opaque	bond, vellum, film
Blue	MI–117	medium	very long	transparent	vellum
Red	MI–118	medium	very long	transparent	vellum
Green	MI–119	medium	very long	transparent	vellum
Black	MI–1181	medium	long	opaque	bond, vellum

TABLE 4–6. INK FOR REFILLABLE PENS
(Continued)

COLOR	PART NO.	DRYING TIME	OPEN PEN TIME	INK TYPE	RECOMMENDED MEDIA
Red	MI–1182	medium	long	opaque	bond, vellum
Blue	MI–1183	medium	long	opaque	bond, vellum
Green	MI–1184	medium	long	opaque	bond, vellum
Black	MI–1185	slow	medium	opaque	matte–film
Red	MI–1186	slow	medium	opaque	matte–film
Blue	MI–1187	slow	medium	opaque	matte–film
Green	MI–1188	slow	medium	opaque	matte–film

TABLE 4–7. FIBER–TIP WATER–BASED INK PENS

INK COLOR	FINE (0.30 MM) PART NO.	BROAD (0.70 MM) PART NO.	QUANTITY
INDIVIDUAL PENS:			
Black	MP–939	MP–973	4 each
Red	MP–940	MP–974	4 each
Blue	MP–941	MP–975	4 each
Green	MP–942	MP–976	4 each
Turquoise	MP–948	MP–980	4 each
Orange	MP–945	MP–977	4 each
Yellow	MP–947	MP–979	4 each
Lime Green	MP–946	MP–978	4 each
Violet	MP–943	N/A	4 each
Brown	MP–944	N/A	4 each
KITS:			
Black, red, blue, green	MP–642	MP–1001	1 each
Black, red, blue, green, violet, orange	MP–640	N/A	1 each
Black, red, blue, green, violet, orange, brown, lime green	MP–641	N/A	1 each
Orange, dark brown, turquoise, violet	MP–982	N/A	1 each
Orange, lime green, turquoise, yellow	N/A	MP–1002	1 each

TABLE 4–8. FIBER–TIP SOLVENT–BASED INK PENS

INK COLOR	PART NO.	QUANTITY
INDIVIDUAL PENS:		
Black	MP–931	4 each
Red	MP–932	4 each
Blue	MP–933	4 each
Green	MP–934	4 each
Violet	MP–935	4 each
Brown	MP–936	4 each
Orange	MP–937	4 each
Yellow	MP–938	4 each
KITS:		
Black, red, blue, green, violet, orange, brown, yellow	MP–601	1 each

TABLE 4–9. ROLLER BALL PENS

INK COLOR	PART NO.	QUANTITY
INDIVIDUAL PENS:		
Black	MP 8159	4 each
Red	MP–8160	4 each
Blue	MP–8162	4 each
Green	MP–8161	4 each
Violet	MP–8164	4 each
Turquoise	MP–8165	4 each
Brown	MP–8169	4 each
Orange	MP–8168	4 each
Yellow	MP–8163	4 each
Magenta	MP–8166	4 each
KITS:		
Black, red, blue, green	MP–8155	1 each
Yellow, violet, turquoise, magenta	MP–8156	1 each

4.5 MEDIA COMPATIBILITY

Houston Instrument offers a wide range of approved pens and chart types (or media) for your plotter. It is important to remember that use of any other plotting media is **NOT** recommended. Use of unapproved media may result in degraded plot quality, damage to the pen or chart, or possible damage to the plotter.

Note that not all pen types may be used with all chart types. For best plotting results, refer to Figure 4–6 before ordering or loading a chart to see which pen type is recommended for use with it. The velocities shown in the figure provide the highest quality results with the use of all of the different pen tip sizes. As a general rule, the smaller tip sizes (0.25 mm and 0.35 mm) will provide perfectly acceptable plot outputs at velocities exceeding those shown in the appropriate ranges. The larger pen tip sizes (0.50 mm and 0.70 mm) operate most effectively within the velocity ranges shown due to their ink flow characteristics.

HI MEDIA / PEN COMPATIBILITY CHART					
APPLICATION	HI MEDIA TYPE	HI PEN TYPE	VELOCITY AND OUTPUT QUALITY		
			FINAL PLOT	DRAFT PLOT	CHECK PLOT
ENGINEERING DRAWINGS DESIGN DRAWINGS ARCHITECTURAL DRAWINGS CIVIL DRAWINGS	SINGLE MATTE POLYESTER FILM	DISPOSABLE FILM	8 TO 20 ips	12 TO 20 ips	20 TO 32 ips
		REFILLABLE TUNGSTEN	8 TO 12 ips	12 TO 20 ips	N/R
		FIBER (SOLVENT BASE INK)	4 TO 8 ips	8 TO 16 ips	N/R
	PREMIUM PLUS VELLUM OR TRANSLUCENT BOND	DISPOSABLE PAPER	8 TO 12 ips	12 TO 24 ips	24 TO 32 ips
		REFILLABLE TUNGSTEN	8 TO 12 ips	12 TO 20 ips	20 TO 32 ips
		REFILLABLE PAPER (SS)	8 TO 12 ips	12 TO 20 ips	20 TO 32 ips
		CERAMIC	4 TO 8 ips	8 TO 16 ips	16 TO 24 ips
		FIBER (WATER BASE INK)	4 TO 8 ips	8 TO 16 ips	N/R
		ROLLERBALL	N/R	UP TO 16 ips	UP TO 32 ips
ELECTRONIC CIRCUIT BOARDS	SINGLE MATTE POLYESTER FILM	DISPOSABLE FILM	8 TO 20 ips	12 TO 20 ips	20 TO 32 ips
		REFILLABLE TUNGSTEN	8 TO 12 ips	12 TO 20 ips	N/R
		FIBER (SOLVENT BASE INK)	4 TO 8 ips	8 TO 16 ips	N/R
BUSINESS CHARTS / GRAPHS	GLOSSY PRESENTATION BOND, OR MATTE PRESENTATION BOND, OR TRANSLUCENT BOND	FIBER (WATER BASE INK)	4 TO 8 ips	8 TO 16 ips	N/R
		CERAMIC	4 TO 8 ips	8 TO 16 ips	16 TO 24 ips
		ROLLERBALL	N/R	UP TO 16 ips	UP TO 32 ips
OVERHEAD TRANSPARENCIES	CLEAR COATED FILM	FIBER (WATER BASE INK)	4 TO 8 ips	8 TO 16 ips	N/R
	CLEAR ACETATE FILM	FIBER (SOLVENT BASE INK)	4 TO 8 ips	8 TO 16 ips	N/R

N/R = Not Recommended

FIGURE 4–6. MEDIA COMPATIBILITY

SECTION 5
USER SELECT MENU

5.1 INTRODUCTION

This section provides information for using the USER SELECT menu.

5.2 MENU OPERATION

Press the left arrow or right arrow key until the desired value is displayed. Then press the **ENTER** key to select that value. An asterisk (*) displayed next to a value indicates that value is selected. You may display all choices by using the left arrow or right arrow keys, but only the value indicated by the asterisk is selected and will be used by the plotter.

To exit this menu for another menu, press the **MENU** key until the desired menu is displayed. To exit any menu and return to the online condition, press **ONLINE.** To load a chart or reset the plotter, press the **RESET/LOAD** key.

5.3 USER SELECT

USER SELECT
1   2   3   4

The USER SELECT menu selects the active plotter configuration from among four internally maintained sets of configuration parameters. After selecting a configuration number, use the CONFIGURATION menu to choose parameter values to be maintained for that number. Always verify the appropriate USER SELECT number is selected before choosing parameter values with the CONFIGURATION menu.

To select a previously entered configuration, simply select the USER SELECT number in this menu, press the **ENTER** key, and press the **ONLINE** key to return to the online condition with those particular parameters.

NOTE

Always select the appropriate USER SELECT number BEFORE starting a plot. Changing the selected configuration during a plotting session may abort the plot.

To obtain a hard copy of the various USER SELECT configurations for your records, use the MENU PLOT feature described in Paragraph 9.4. See Figure 5–1. It is recommended that you use the MENU PLOT feature any time you change the configuration. To restore all four selections to the factory settings, use the INSTALL MENU feature described in Paragraph 10.13.

For example, you may wish to configure USER SELECT 1 and 2 for one plotting software package, and USER SELECT 3 and 4 for a second software package. For each of these packages, one configuration could be at a fast speed for using roller ball pens and translucent bond paper for high speed check plots. The second configuration could be at a slower speed (but otherwise identical) for using stainless steel pens on vellum for your final plots.

```
DMP162    1358001  1359001  1351001
CURRENT USER: 3
```

PARAMETER	USER 1	USER 2	USER 3	USER 4
PEN 1 VELOCITY	600 MM/S	600 MM/S	16 IPS	
PEN 2 VELOCITY	600 MM/S	600 MM/S	16 IPS	
PEN 3 VELOCITY	600 MM/S	600 MM/S	16 IPS	
PEN 4 VELOCITY	600 MM/S	600 MM/S	16 IPS	
PEN 5 VELOCITY	400 MM/S	600 MM/S	16 IPS	
PEN 6 VELOCITY	400 MM/S	600 MM/S	16 IPS	
PEN 7 VELOCITY	400 MM/S	400 MM/S	16 IPS	
PEN 8 VELOCITY	400 MM/S	400 MM/S	16 IPS	
PEN 1 TIP SIZE	.35MM	.35MM	.35MM	
PEN 2 TIP SIZE	.35MM	.35MM	.35MM	
PEN 3 TIP SIZE	.35MM	.35MM	.35MM	
PEN 4 TIP SIZE	.35MM	.35MM	.35MM	
PEN 5 TIP SIZE	.70MM	.35MM	.35MM	
PEN 6 TIP SIZE	.70MM	.35MM	.35MM	
PEN 7 TIP SIZE	.70MM	.70MM	.35MM	
PEN 8 TIP SIZE	.70MM	.70MM	.35MM	
VEL OVERRIDE	HOST CONTROL	HOST CONTROL	IGNORE HOST	
PEN ACCEL	4.0g	4.0g	2.0g	
MEDIA VEL	600 MM/S	600 MM/S	16 IPS	
# OF PENS	8	8	6	
PENS/GROUP	4	2	1	
LANGUAGE	HP-GL	HP-GL/2	DM/PL	SCAN-CAD
OPTIMIZATION	ON	ON	OFF	
MENU UNITS			ENGLISH	
AUTO-CAPPING	15 S	30 S	120 S	
PEN PAUSE	DISABLE	DISABLE	DISABLE	
ORIENTATION	NORMAL	NORMAL	NORMAL	
ADDRESSING			.001 INCH	
TEXT FONT			F0	
TEXT SPACING			PROP.	
CHAR SET			G0	
OPEN FONTS			FILLED	
ZERO CHAR	PLAIN	SLASH	PLAIN	
BAUD RATE	9600	19200	38400	
PARITY	EVEN	EVEN	NONE	
RTS/DTR	HIGH	HIGH	TOGGLE	
LINE STATUS	STANDALONE	STANDALONE		
DM/PL ERRORS			IGNORED	

FIGURE 5–1. EXAMPLE CONFIGURATION

SECTION 6
LCD CONTRAST MENU

6.1 INTRODUCTION

This section provides information for using the LCD contrast menu.

6.2 MENU OPERATION

Press the up arrow or down arrow key until the desired contrast is displayed. To exit this menu for another menu, press the **MENU** key until the desired menu is displayed. To exit any menu and return to the online condition, press **ONLINE**. To load a chart or reset the plotter, press the **RESET/LOAD** key.

6.3 LCD CONTRAST

LCD CONTRAST
↑ ↓ ADJUSTMENT

The LCD CONTRAST menu is used to adjust the contrast (or intensity) of the liquid crystal display on the control panel.

NOTE

If the display is set to an unreadable level and you are not in this menu, power the plotter off then on, press the **MENU** key two times, and use the up arrow or down arrow key to adjust the level.

SECTION 7
CONFIGURATION MENU

7.1 INTRODUCTION

This section provides information for using the configuration menu.

7.2 CONFIGURATION

CONFIGURATION
ENTER

The CONFIGURATION menu is used to access the various sub-menus to configure the plotter operating parameters. The various configuration sub-menus are summarized in Table 7-1 as a quick-reference listing. Notice that some sub menus are available depending on the active plotting language, some sub-menus are available only when in SERVICE MODE, and other sub-menus are available only on the DMP-162R plotter.

These configurations are the items saved under the various USER SELECT numbers, as described in Section 5. Remember that there are four different configurations, which are independently maintained. Be sure to select the configuration number in the USER SELECT menu before altering the items in the CONFIGURATION menu.

The various CONFIGURATION sub–menus are shown in Figure 7–1. To access the sub–menus, press the **ENTER** key at the CONFIGURATION menu.

TABLE 7–1. CONFIGURATION QUICK–REFERENCE

SUB–MENU	DESCRIPTION	REFERENCE PARAGRAPH
CONFIGURATION SUB–MENUS:		
# OF PENS * %	Specifies available pens in the pen changer.	7.17
ADDRESSING *	Selects the default DM/PL user addressable resolution.	7.25
AUTO–CAPPING * %	Sets time to return a pen to pen changer.	7.22
BAUD RATE * %	Selects RS–232–C baud rate.	7.31
CHAR SET *	Selects the default DM/PL character set.	7.28
DM/PL ERRORS *	Selects communication error reporting.	7.35
LANGUAGE * & %	Selects the active plotting language.	7.19
LINE STATUS %	Simulates HP STANDALONE EAVESDROP switch.	7.34
MEDIA VEL * %	Selects media axis velocity.	7.8
MENU UNITS *	Sets menu English or metric display units.	7.21
OPEN FONTS *	Selects fill for DM/PL fillable text fonts.	7.29
OPTIMIZATION * %	Selects plot code optimization.	7.20
ORIENTATION * %	Sets the orientation of the chart.	7.24
PARITY * %	Selects RS–232–C parity type.	7.32
PEN ACCEL * %	Sets the pen acceleration.	7.7
PEN PAUSE * %	Sets pen pause feature.	7.23
PEN TIP SIZE * %	Sets pen tip width.	7.5
PEN VELOCITY * %	Selects the pen velocity.	7.4

NOTES:

* Available when DM/PL is active language.

& Available when SCAN–CAD is active language. No other sub–menus are available for SCAN–CAD. Plotter control is through the scanning software.

% Available when HP-GL or HP-GL/2 is active language.

\# Available when SERVICE MODE is active (see Section 10).

@ Available on DMP-162R only.

TABLE 7–1. CONFIGURATION QUICK–REFERENCE (Continued)

SUB–MENU	DESCRIPTION	REFERENCE PARAGRAPH
CONFIGURATION SUB–MENUS (Continued):		
PENS/GROUP * %	Specify pen groups.	7.18
RTS/DTR * %	Sets RS–232–C RTS and DTR signals.	7.30
TEXT FONT *	Selects the DM/PL text font.	7.23
TEXT SPACING *	Selects DM/PL text character spacing.	7.24
VEL OVERRIDE * %	Selects pen down velocity override.	7.6
ZERO CHARACTER * %	Selects zero text character type.	7.27
SERVICE MODE SUB–MENUS:		
CARRIAGE ACC * % #	Sets pen carriage acceleration.	7.11
CARRIAGE VEL * % #	Sets pen carriage velocity.	7.10
CHART CMNDS * #	Sets DM/PL EF & EH response.	7.33
DOWN DELAY * % #	Sets the pen down delay before a move.	7.13
MEDIA ACC * % #	Selects media axis acceleration.	7.9
UP DELAY * % #	Sets pen up delay before a move.	7.12
DMP-162R SUB–MENUS:		
CHART FEED * % @	Selects the plotter chart type.	7.14
LOAD DELAY * & % @	Sets time to allow roll chart to stabilize.	7.15
CUT DELAY * & % # @	Sets time to allow static charge on roll chart to dissipate.	7.16

NOTES:

* Available when DM/PL is active language.

& Available when SCAN–CAD is active language. No other sub–menus are available for SCAN–CAD. Plotter control is through the scanning software.

% Available when HP-GL or HP-GL/2 is active language.

\# Available when SERVICE MODE is active (see Section 10).

@ Available on DMP-162R only.

PEN VELOCITY * %	LOAD DELAY * & % @	TEXT FONT *
PEN TIP SIZE * %	CUT DELAY * & % # @	TEXT SPACING *
VEL OVERRIDE * %	# OF PENS * %	CHAR SET *
PEN ACCEL * %	PENS/GROUP * %	OPEN FONTS *
MEDIA VEL * %	LANGUAGE * & %	ZERO CHAR * %
MEDIA ACC * % #	OPTIMIZATION * %	BAUD RATE * %
CARRIAGE VEL * % #	MENU UNITS *	PARITY * %
CARRIAGE ACC * % #	AUTO - CAPPING * %	RTS/DTR * %
UP DELAY * % #	PEN PAUSE * %	LINE STATUS %
DOWN DELAY * % #	ORIENTATION * %	DM/PL ERRORS *
CHART FEED * % @	ADDRESSING *	CHART CMNDS * #
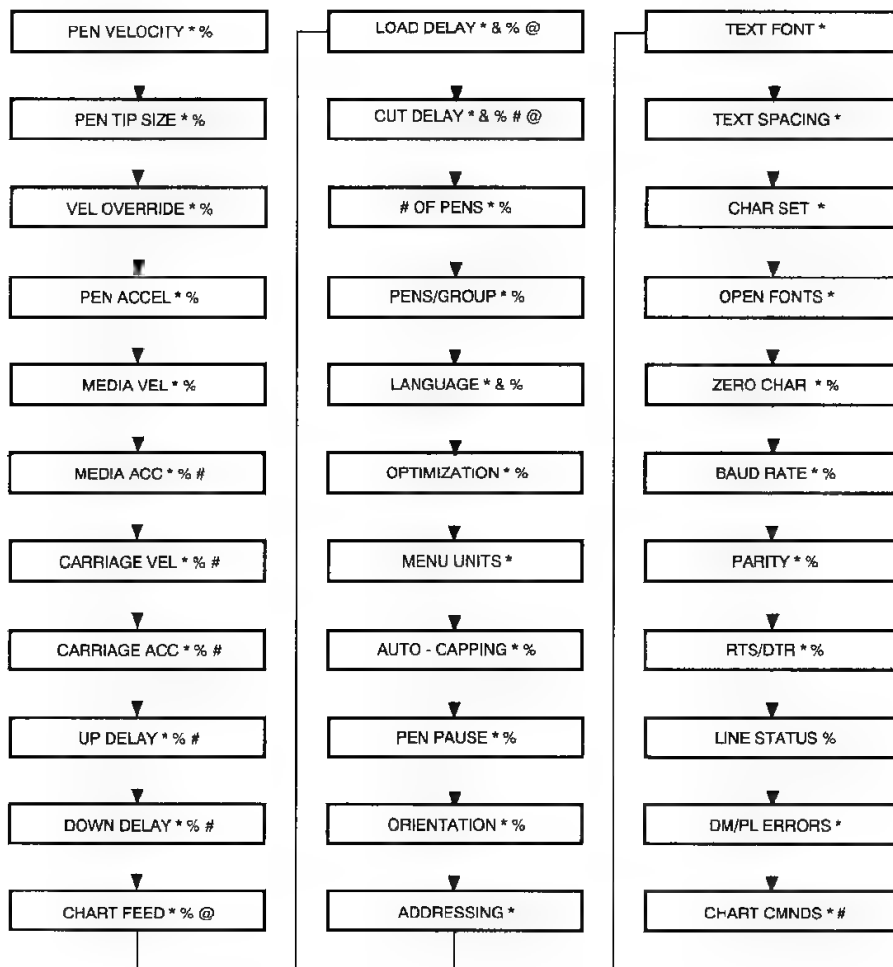
NOTES

* DM/PL MENU.
X SCAN - CAD MENU
% HP - GL OR HP - GL/2 MENU
# SERVICE MODE MENU.
@ DMP-162R MENU.

FIGURE 7–1. CONFIGURATION SUB–MENUS

7.3   MENU OPERATION

Press the up arrow or down arrow key until the desired sub–menu is displayed. Now choose a parameter by pressing the left arrow or right arrow key until the desired parameter value is displayed. Then press the **ENTER** key to select that value. An asterisk (*) displayed next to a value indicates that value is selected. You may display all choices by using the left arrow or right arrow key, but only the value indicated by the asterisk is selected and will be used by the plotter. Continue to choose other sub–menus with the up arrow or down arrow key. Choosing some parameters may require a slightly different operation than explained here; such operation is explained in the paragraphs that follow for each parameter.

To exit this menu for another menu, press the **MENU** key until the desired menu is displayed. To exit any menu and return to the online condition, press **ONLINE**. To load a chart or reset the plotter, press the **RESET/LOAD** key.

Notice that the sub–menu explanations are organized in the following format:

- **NAME.** The name of the sub–menu is given in the paragraph title.

- **DISPLAY.** This shows how the plotter displays the sub–menu name on the LCD display.

- **PARAMETERS.** This shows the available parameters for the sub–menu.

- **DEFAULT.** The factory default value is shown here.

- **LANGUAGES.** This indicates under which plotting language(s) the sub–menu is active. If a sub–menu is not active for the present language, it is not displayed.

- **SET VIA.** If CONFIGURATION is listed here, the sub–menu can be displayed when the plotter is in the CONFIGURATION menu. If SERVICE MODE is listed here, the sub–menu can be displayed when SERVICE MODE (see Section 10) is active. If HOST LANGUAGE is listed here, the PARAMETERS value may be overridden by host computer plotting LANGUAGE commands.

- **FUNCTION.** This describes the purpose of the sub–menu.

- **SELECTION.** This gives special instructions for parameter selection in some sub–menus. Otherwise, parameter selection is with the left arrow, right arrow, and **ENTER** keys as previously described.

- **GENERAL.** This gives general information about the parameters or sub–menu.

Note that sub–menus with velocity parameters are expressed in either English or metric units. For DM/PL, if ENGLISH is selected for menu units (Paragraph 7.21), the parameters are listed in inches per second (IPS). If METRIC is selected, the parameters are listed in millimeters per second (MM/S) for DM/PL. For HP-GL or HP-GL/2, the parameters are always in MM/S.

Some parameters can be overridden by specific host computer plot language commands. When overriding is possible, it is so noted in the description of that sub–menu.

7.4   PEN VELOCITY

DISPLAY: PEN VELOCITY

PARAMETERS: <PEN>   <SPEED>

PEN =   ALL 1 2 3 4 5 6 7 8
SPEED = 1 2 4 6 8 10 12 14 16 18 20 22 24 28 32   MAX IPS
            30 50 100 150 200 250 300 350 400 450 500 550 600 700 800 MAX MM/S

DEFAULT: 24 IPS (600 MM/S)

LANGUAGES: DM/PL, HP-GL, HP-GL/2

SET VIA: CONFIGURATION, SERVICE, HOST LANGUAGE

FUNCTION: The PEN VELOCITY menu selects the pen down velocity for each pen or group. If PEN/GROUP is set to two, four, or eight pens per group, the pen numbers in this menu apply to the groups not the individual pens.

SELECTION: Select the desired pen with the **PEN SELECT** key. Select the velocity with the left arrow or right arrow keys, then press the **ENTER** key.

GENERAL:

If ALL is displayed for PEN, the selected velocity applies to all eight pens. If a number is displayed, the selected velocity applies only to that particular pen (this feature allows you to set an individual velocity for each pen). If different velocities are set for the pens, the speed is indicated with a question mark (?) when ALL is selected.

The MAX velocity selection is 32 ips (800 mm/s) without constant velocity — that is, diagonal moves are at 45 ips (1140 mm/s). Constant velocity is applied for all other velocity selections.

7.5   PEN TIP SIZE

DISPLAY: PEN TIP SIZE

PARAMETERS: <PEN>   <SIZE>

PEN =   ALL   1   2   3   4   5   6   7   8
SIZE =   .25   .35   .50   .70   1.00   MM

DEFAULT: ALL,   .35 MM

LANGUAGES: DM/PL, HP-GL, HP-GL/2

SET VIA: CONFIGURATION, SERVICE

FUNCTION: The PEN TIP SIZE menu selects the pen tip size for any pen or group. If PEN/GROUP is set to two, four, or eight pens per group, the pen numbers in this menu apply to the groups not the individual pens.

SELECTION: Select the desired pen with the **PEN SELECT** key. Select the pen tip size with the left arrow or right arrow keys, then press the **ENTER** key.

GENERAL: This setting is used for HP-GL/2 wide line drawings and for DM/PL, HP-GL, and HP-GL/2 solid fills.

If ALL is displayed for PEN, the selected pen tip size applies to all eight pens. If a number is displayed, the selected pen tip size applies only to that particular pen (this feature allows you to load different pen tip widths for the pens). If different pen tip sizes are set for the pens, a question mark (?) will be displayed for size when ALL is selected.

For the most efficient solid fills, be sure that the selected pen tip sizes in this menu match the actual pen tip widths of the pens installed in the plotter.

7.6   VELOCITY OVERRIDE

DISPLAY: VEL OVERRIDE

PARAMETERS: HOST CONTROL   IGNORE HOST

DEFAULT: HOST CONTROL

LANGUAGES: DM/PL, HP-GL, HP-GL/2

SET VIA: CONFIGURATION, SERVICE

FUNCTION: The VEL OVERRIDE menu selects how the pen down velocity is set for a plot.

GENERAL: When IGNORE HOST is selected, the pen velocity specified in the PEN VELOCITY menu (Paragraph 7.4) is the velocity used for all plots. The plotter ignores all plotting software velocity commands. This is useful when you wish to slow down a plot to improve its quality. When HOST CONTROL is selected, the pen velocity can be changed by the plotting software.

7.7 PEN ACCELERATION

DISPLAY: PEN ACCEL

PARAMETERS: 1.0   2.0   3.0   4.0   g

DEFAULT: 4.0 g

LANGUAGES: DM/PL, HP-GL, HP-GL/2

SET VIA: CONFIGURATION,   SERVICE,   HOST LANGUAGE

FUNCTION: The PEN ACCEL menu limits the acceleration in g's (gravity units) when the pen is down. It does not affect acceleration when the pen is up.

GENERAL: For the best plotter throughput, the fastest available pen acceleration is recommended.

If VELOCITY OVERRIDE is set to HOST CONTROL, HP-GL acceleration commands in the plotting software override the value set in this menu.

7.8   MEDIA VELOCITY

DISPLAY: MEDIA VEL

PARAMETERS: 1 2 4 6 8 10 12 14 16 18 20 22 24 28 32 IPS
30 50 100 150 200 250 300 350 400 450 500 550 600 700 800 MM/S

DEFAULT: 32 IPS (800 MM/S) for DMP-161, 24 IPS (600 MM/S)
for DMP-162 and DMP-162R

LANGUAGES: DM/PL, HP-GL, HP-GL/2

SET VIA: CONFIGURATION,   SERVICE

FUNCTION: The MEDIA VEL menu limits the velocity in the media axis.

NOTE

If the media velocity is selected to be slower than the pen velocity, media
axis vectors will be drawn slower than pen axis vectors, which may
result in slightly different line widths.

GENERAL: This setting can be used to improve tracking performance with some chart
types. The media velocity cannot be set above 24 IPS (600 MM/S) for the DMP-162 and
DMP-162R.

7.9   MEDIA ACCELERATION

DISPLAY: MEDIA   ACC

PARAMETERS: 1.0   2.0   3.0   4.0   g

DEFAULT: 4.0 g FOR DMP-161,   2.0 g FOR DMP-162 and DMP-162R

LANGUAGES: DM/PL, HP-GL, HP-GL/2

SET VIA: SERVICE

FUNCTION: The MEDIA ACC menu limits the rate of acceleration in g's (gravity units) for the media axis.

GENERAL: This setting does not affect the carriage axis. For the best plotter throughput, the fastest available chart acceleration is recommended. For DMP-161 plotters, the fastest available selection is 4 g. For DMP-162 and DMP-162R plotters, the fastest available selection is 2 g.

7.10   CARRIAGE VELOCITY

DISPLAY: CARRIAGE VEL

PARAMETERS: 1 2   4 6 8 10 12 14 16 18 20 22 24 28 32 IPS
30 50 100 150 200 250 300 350 400 450 500 550 600 700 800 MM/S

DEFAULT: 32 IPS (800 MM/S)

LANGUAGES: DM/PL, HP-GL, HP-GL/2

SET VIA: SERVICE

FUNCTION: The CARRIAGE VEL menu selects the maximum allowed velocity for the pen carriage.

GENERAL: This setting does not affect the media axis velocity.

7.11 CARRIAGE ACCELERATION

DISPLAY: CARRIAGE ACC

PARAMETERS: 1.0   2.0   3.0   4.0   g

DEFAULT: 4.0 g

LANGUAGES: DM/PL, HP-GL, HP-GL/2

SET VIA: SERVICE

FUNCTION: The CARRIAGE ACC menu sets the maximum allowed rate of acceleration in g's (gravity units) for the pen carriage.

GENERAL: This setting does not affect the media axis. For the best plotter throughput, the fastest available pen carriage acceleration is recommended.

7.12 UP DELAY

DISPLAY: UP DELAY

PARAMETERS: 25 30 35 40 45 50 55 60 65 70 75 80 MS

DEFAULT: 30 MS

LANGUAGES: DM/PL, HP-GL, HP-GL/2

SET VIA: SERVICE

FUNCTION: The UP DELAY menu sets the time in milliseconds (MS) which the plotter waits after lifting the pen.

GENERAL: For the best quality plots, set the pen up delay to 30 MS. Shorter delay times may result in a slight reduction in plot quality. Longer delay times may result in a slight reduction in plotter throughput.

7.13 DOWN DELAY

DISPLAY: DOWN DELAY

PARAMETERS: 25 30 35 40 45 50 55 60 65 70   75   80   MS

DEFAULT: 70 MS for DMP-162 or DMP-162R, 50 MS for DMP-161

LANGUAGES: DM/PL, HP-GL, HP-GL/2

SET VIA: SERVICE

FUNCTION: The DOWN DELAY menu sets the time in milliseconds (MS) which the plotter waits after lowering the pen.

GENERAL: For the best quality plots on the DMP-161, set the pen down delay to 50 MS. For the best quality plots on the DMP-162 or DMP-162R, set the pen down delay to 70 MS. Shorter delay times may result in a slight reduction in plot quality. Longer delay times may result in a slight reduction in plotter throughput.

7.14 CHART FEED

DISPLAY: CHART FEED

PARAMETERS: CUT SHEET   FULL ROLL   HALF ROLL   MANUAL ROLL

DEFAULT: FULL ROLL

LANGUAGES: DM/PL, HP-GL, HP-GL/2

SET VIA: CONFIGURATION, SERVICE

FUNCTION: The CHART FEED menu selects the chart type for DMP-162R plotters. Note that this menu is not displayed for other plotter models.

GENERAL: CUT SHEET selects cut sheet charts as the chart type. When CUT SHEET is selected, the DMP-162R plotter operates exactly like a DMP-162.

FULL ROLL and HALF ROLL select roll charts as the chart type and are the recommended settings for unattended plotting. FULL ROLL should be selected if the default chart size is full size. HALF ROLL should be selected if the default chart size is half size. In either case, the full size chart will be pulled from the roll and the software package on the host can change the size from the default with the appropriate command. The HP-GL/2 PS command and the HP-GL AF or AH commands will change the size of all plots until the next front panel RESET or IN command. In the automatic roll modes, the DM/PL EF or EH command will change the size of the following plot.

MANUAL ROLL also selects roll charts as the chart type, but prompts the user each time a chart is loaded to press the up arrow and down arrow keys to adjust the chart length. The longest plot that can be selected in MANUAL ROLL is 20 feet.

NOTE

Be sure to match the CHART FEED menu setting with the type of chart you are using in the plotter. Otherwise, chart loading errors will occur.

7.15 LOAD DELAY

DISPLAY: LOAD DELAY

PARAMETERS: 0 1 2 4 6 8 10 MIN

DEFAULT: 0

LANGUAGES: DM/PL, HP-GL, HP-GL/2

SET VIA: CONFIGURATION, SERVICE

FUNCTION: The LOAD DELAY menu sets the time in minutes (MIN) to allow the roll chart to stabilize after it is pulled from the roll. After each chart is pulled from the roll, it will expand and contract in response to the humidity in the environment. Only the very outside of the roll will have fully stabilized, assuming the roll was removed from its sealed bag long enough before it was used. More accurate plotting will result if the media is able to finish any expansion or contraction before the plot starts. This function is only available if roll has been selected. See Paragraph 7.14 CHART FEED.

7.16   CUT DELAY

DISPLAY: CUT DELAY

PARAMETERS: 2   3   4   5   6   7   8   SEC

DEFAULT: 3

LANGUAGES: DM/PL, HP-GL, HP-GL/2

SET VIA: CONFIGURATION, SERVICE

FUNCTION: The CUT DELAY menu sets the time in seconds (SEC) to allow static charge on the roll chart to dissipate before the chart is cut and fed into the wireform chute. The delay prevents the leading edge of the chart from rolling back due to static attraction to the wireform chute. The CUT DELAY setting should be increased when environmental conditions result in high static attraction. This function is only available if roll has been selected. See Paragraph 7.14 CHART FEED.

7.17   NUMBER OF PENS

DISPLAY: # OF PENS

PARAMETERS: 1   2   3   4   5   6   7   8

DEFAULT: 8

LANGUAGES: DM/PL, HP-GL, HP-GL/2

SET VIA: CONFIGURATION, SERVICE

FUNCTION: The # OF PENS menu sets the number of pens that can be used during a plot when the pen changer is installed and active. If the pen changer is not active, the # OF PENS is assumed to be 1.

GENERAL: If your plotter is operating as a single–pen unit (pen changer removed or pen changer arm up), the # OF PENS menu setting has no effect. Otherwise, set this menu to the number of pens actually installed in the pen changer (the pens must be in consecutive stalls, starting with number 1).

Note that an automatic substitution of pen number occurs if the host plotting program requests a pen number above what has been set with this parameter. Table 7–2 shows which pen will actually be used when this condition occurs. The vertical axis of the table is the # OF PENS parameter setting and the horizontal axis of the table is the pen number request by the host.

For example, if the # OF PENS is set to 4, and the host requests pen 3, pen 3 will be used. If the # OF PENS is set to 4, and the host requests pen 5, pen 1 will be used.

TABLE 7–2. PEN SUBSTITUTION

# OF PENS	HOST–REQUESTED PEN NUMBER															
	0	1	2	3	4	5	6	7	8	8	9	11	12	13	14	15
	DM/PL PEN COMMAND															
	P0	P1	P2	P3	P4	P5	P6	P7	P8	P1+	P2+	P3+	P4+	P5+	P6+	P7+
	HP-GL OR HP-GL/2 SELECT PEN COMMAND															
	SP0	SP1	SP2	SP3	SP4	SP5	SP6	SP7	SP8							
1 PEN	*	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
2 PENS	*	1	2	1	2	1	2	1	2	2	1	2	1	2	1	2
3 PENS	*	1	2	3	1	2	3	1	2	2	3	1	2	3	1	2
4 PENS	*	1	2	3	4	1	2	3	4	4	1	2	3	4	1	2
5 PENS	*	1	2	3	4	5	1	2	3	3	4	5	1	2	3	4
6 PENS	*	1	2	3	4	5	6	1	2	2	3	4	5	6	1	2
7 PENS	*	1	2	3	4	5	6	7	1	1	2	3	4	5	6	7
8 PENS	*	1	2	3	4	5	6	7	8	8	1	2	3	4	5	6

NOTES:

* Returns the presently selected pen to its stall. Has no effect if no pen is selected.

7.18 PENS/GROUP

DISPLAY: PENS/GROUP

PARAMETERS: 1   2   4   8

DEFAULT: 1

LANGUAGES: DM/PL, HP-GL, HP-GL/2

SET VIA: CONFIGURATION, SERVICE

FUNCTION: The PENS/GROUP menu assigns how many adjacent pens are in a group.

GENERAL: Pen grouping provides a means of improving the effective life and reliability of pens. Adjacent pens are arranged into groups as shown in Table 7–3. Each group is treated as a single pen in response to host computer requests for a given pen. Thus, a request for pen 2 will be treated as a request for a pen from group 2. The plotter will then select a pen from group 2. After plotting a given number of feet, the plotter will automatically exchange the present pen for the next pen in the same group. When all pens in the group have been used, the plotter begins again with the first pen in that group. This ensures that all pens within the group are used frequently and wear at about the same rate. Frequent use also keeps pens from drying out.

TABLE 7–3. PENS/GROUP

PENS/GROUP SETTING	PENS IN THE GROUP
1	1, 2, 3, 4, 5, 6, 7, 8
2	1 and 2, 3 and 4, 5 and 6, 7 and 8
4	1 thru 4, 5 thru 8
8	1 thru 8

7.19 LANGUAGE

DISPLAY: LANGUAGE

PARAMETERS: DM/PL HP-GL HP-GL/2 SCAN–CAD

DEFAULT: DM/PL

LANGUAGES: DM/PL, SCAN–CAD, HP-GL, HP-GL/2

SET VIA: CONFIGURATION, SERVICE

FUNCTION: The LANGUAGE menu is used to select the active plotting language for the plotter.

NOTE

It is important to remember that the active plotting language MUST match the plotting software. SCAN–CAD MUST be the active plotting language when using the Model 128A or 128AMC SCAN–CAD accessory.

GENERAL: Select a language supported by the host computer's plotting software.

DM/PL selects Houston Instrument Digital Microprocessor/Plotting Language (DM/PL) as the active plotting language. This selection allows the plotter to operate with DM/PL–based plotting software.

Select HP-GL as the LANGUAGE to emulate an HP model 7585B plotter.

Select HP-GL/2 as the LANGUAGE to emulate an HP DraftMaster SX/RX plotter.

SCAN CAD must be selected when using the plotter with the HI Model 128 series SCAN–CAD accessory. When SCAN–CAD is selected, the plotter is set for the DM/PL plotting language and various operating parameters required by the scanning software. Note that only the LANGUAGE sub–menu and the CONFIGURATION, SERVICE, USER SELECT, and LCD CONTRAST menus are available when SCAN–CAD is selected as the active language.

7.20   OPTIMIZATION

DISPLAY: OPTIMIZATION

PARAMETERS: ON   OFF

DEFAULT: ON

LANGUAGES: DM/PL, HP-GL, HP-GL/2

SET VIA: CONFIGURATION, SERVICE

FUNCTION: The OPTIMIZATION menu allows the plotter optimization to be turned ON or OFF. When ON, both pen and vector sorting are performed on the incoming plot code.

GENERAL: The optimization feature is used to decrease the time required to generate a plot.

If OFF is selected, no optimization is attempted on the incoming plot code. If ON is selected, the incoming plot code is sorted and stored in plotter memory according to the pen used and vector position. The plot code is then plotted in a way that is the most efficient.

Many plotting software packages also offer optimization algorithms. Some have options for various optimization levels. In general, the best performance will result when only pen sorting is selected in the plotting software (if it is available) and OPTIMIZATION is set to ON in this menu.

7.21   MENU UNITS

DISPLAY: MENU UNITS

PARAMETERS: ENGLISH   METRIC

DEFAULT: ENGLISH

LANGUAGES: DM/PL

SET VIA: CONFIGURATION, SERVICE

FUNCTION: The MENU UNITS menu allows you to select either English or metric menu measurement units for DM/PL.

GENERAL: If ENGLISH is specified, DM/PL velocity menus are listed in inches per second. If METRIC is specified, DM/PL velocity menus are listed in millimeters per second.

7.22 AUTO–CAPPING

DISPLAY: AUTO–CAPPING

PARAMETERS: DISABLE 15 30 60 120 240 480 S

DEFAULT: 120 S

LANGUAGES: DM/PL, HP-GL, HP-GL/2

SET VIA: CONFIGURATION, SERVICE

FUNCTION: The AUTO–CAPPING menu sets the amount of time after the plotter becomes inactive (usually because the plot is complete or because the plotter has been set to OFFLINE) before the plotter returns the present pen to its stall in the pen changer.

GENERAL: This feature is designed to prevent ink drying on the tips of drafting pens. This menu has no effect if the pen changer is not installed on the plotter or the pen changer arm is in the up position.

This menu selects one of six different time limits in seconds (S) for inactivity before the plotter beeps and automatically returns a selected pen to its stall. After a pen is returned, the pen holder parks in front of that stall and waits for additional plot codes. The plotter does not return a pen to its stall during periods of inactivity if DISABLE is specified. Typical values are 15 seconds for stainless steel and tungsten tip drafting type pens and 60 seconds for roller ball or hard nib pens.

For example, if 15 is selected and the plotter is processing a plot, it beeps and automatically returns a pen to its stall any time a 15–second break occurs in plotting.

7.23 PEN PAUSE

DISPLAY: PEN PAUSE

PARAMETERS: DISABLE   ENABLE

DEFAULT: DISABLE

LANGUAGES: DM/PL, HP-GL, HP-GL/2

SET VIA: CONFIGURATION, SERVICE

FUNCTION: The PEN PAUSE menu permits making multi–pen plots on a single–pen plotter.

GENERAL: If PEN PAUSE is set to ENABLE and a pen changer is not active, the display will prompt the user to manually change pens whenever the host software sends a pen change command to the plotter. The user should then place an appropriate pen into the pen holder and press the **1** key to resume plotting without loss of data.

If PEN PAUSE is set to DISABLE or if a pen changer is active, the pen pause feature is disabled.

7.24 ORIENTATION

DISPLAY: ORIENTATION

PARAMETERS: NORMAL   ROTATED

DEFAULT: NORMAL

LANGUAGES: DM/PL, HP-GL, HP-GL/2

SET VIA: CONFIGURATION, SERVICE, HOST LANGUAGE

FUNCTION: The ORIENTATION menu selects how the plot is oriented on the chart.

GENERAL: When NORMAL is selected, the x–axis of the plot is aligned with the long axis of the chart. When ROTATED is selected, the y–axis of the plot is aligned with the long axis of the chart. Also see Paragraph 7.36.

The HP-GL or HP-GL/2 Rotate RO command will override the ORIENTATION setting until a front panel RESET or an Initialize IN command occurs. The DM/PL Full Chart EF and Half Chart EH commands will change the media axis length in the automatic roll modes of the DMP-162R (FULL ROLL and HALF ROLL), thereby affecting the orientation of the plot.

7.25 ADDRESSING

DISPLAY: ADDRESSING

PARAMETERS: .001 INCH   .005 INCH   .025 MM   .100 MM   NORMALIZED

DEFAULT: .001 INCH

LANGUAGES: DM/PL

SET VIA: CONFIGURATION, SERVICE, HOST LANGUAGE

FUNCTION: The ADDRESSING menu selects the plotter's default DM/PL user addressable resolution.

GENERAL: If NORMALIZED is selected, the plotter automatically scales a plot to fit on the presently installed chart size if the plot code was written using DM/PL Coordinate Addressing EC0 units. The present ENGLISH or METRIC MENU UNITS selection (Paragraph 7.21) does not affect the resolution selection.

7.26 TEXT FONT

DISPLAY: TEXT FONT

PARAMETERS: F0   F1   F2   F3   F4   F5   F6

DEFAULT: F0

LANGUAGES: DM/PL

SET VIA: CONFIGURATION, SERVICE, HOST LANGUAGE

FUNCTION: The TEXT FONT menu selects the default DM/PL text font (character style) for the plotter to use when plotting text.

GENERAL: The seven DM/PL text fonts are F0 single stroke, F1 serif, F2 sans serif, F3 serif bold, F4 sans serif bold, F5 ISO drafting, and F6 script. The DM/PL text fonts are illustrated in the FONT DEMO plot in the INTERNAL PLOTS menu described in Paragraph 9.7. Table 7–4 shows the various font and character set combinations available for this plotter.

TABLE 7–4. FONT AND CHARACTER SET COMBINATIONS

CHARACTER SET	FONT						
	F0 SINGLE STROKE	F1 SERIF	F2 SANS SERIF	F3 SERIF BOLD	F4 SANS SERIF BOLD	F5 ISO DRAFTING	F6 SCRIPT
G0 ASCII &	*	*	*	*	*	*	*
G1 MATHEMATICS &	*	*	*	*	*	*	*
G2 GERMAN &	*	*	*	*	*	*	*
G3 FRENCH &	*	*	*	*	*	*	*
G4 SWEDISH &	*	*	*	*	*	*	*
G5 NORWEGIAN/ DANISH &	* *	*	*	*	*	*	*
G6 SPANISH &	*	*	*	*	*	*	*
G7 ITALIAN &	*	*	*	*	*	*	*
G8 CYRILLIC &	*						
G9 KATAKANA %	*						
G10 GREEK &	*						

NOTES:

& Zero character for this set is only selectable with the ZERO CHARACTER menu.
% Menu ZERO CHARACTER setting ignored for this character set.

7.27 TEXT SPACING

DISPLAY: TEXT SPACING

PARAMETERS: PROP. VARIABLE NON–PROP.

DEFAULT: PROP.

LANGUAGES: DM/PL

SET VIA: CONFIGURATION, SERVICE, HOST LANGUAGE

FUNCTION: The TEXT SPACING menu selects the default character spacing for plotting DM/PL text.

GENERAL: PROP. selects proportional character spacing, where the character width varies according to the character. The character cell width is adjusted to create uniform spacing between the characters. The entire string is scaled to a length equal to an identical string using NON–PROP. This parameter is the default (and recommended) value for all text fonts, except for script.

VARIABLE also selects proportional character spacing, where the character width also varies according to the character. However, the character cell width is not adjusted to create uniform spacing between the characters. No scaling is done to make the length identical to a string using NON–PROP. Therefore, the string length is unpredictable. This parameter is the default and recommended value for the F6 script font.

NON–PROP. selects non–proportional (fixed) character spacing, where each character is centered within a character cell of uniform width.

Figure 7–2 shows the effects of the non–proportional, proportional, and variable parameters on identical text strings. Notice that non–proportional produces fixed character spacings and that the characters align in columns. For proportional, notice that the character widths and inter–character spacings are adjusted according to the string length. For variable, notice that the character widths and inter–character spacing are not adjusted according to the string length.

NON-PROPORTIONAL:
ABCDEFGHIJKLMNOPQRSTUVWXYZ
abcdefghijklmnopqrstuvwxyz
Ø123456789

PROPORTIONAL:
ABCDEFGHIJKLMNOPQRSTUVWXYZ
abcdefghijklmnopqrstuvwxyz
Ø123456789

VARIABLE:
ABCDEFGHIJKLMNOPQRSTUVWXYZ
abcdefghijklmnopqrstuvwxyz
Ø123456789

FIGURE 7–2. TEXT SPACING

7.28   CHARACTER SET

DISPLAY: CHAR SET

PARAMETERS: G0   G1   G2   G3   G4   G5   G6   G7   G8   G9   G10

DEFAULT: G0

LANGUAGES: DM/PL

SET VIA: CONFIGURATION, SERVICE, HOST LANGUAGE

FUNCTION: The CHAR SET menu selects the default DM/PL character set for the plotter to use when plotting text.

GENERAL: The 11 DM/PL character sets are G0 standard ASCII, G1 mathematics, G2 German, G3 French, G4 Swedish, G5 Norwegian/Danish, G6 Spanish, G7 Italian, G8 Katakana, G9 Cyrillic, and G10 Greek. DM/PL character sets G0 through G10 are illustrated in the FONT DEMO plot in the INTERNAL PLOTS menu described in Paragraph 9.7. Table 7–4 shows the various font and character set combinations available for this plotter.

7.29 OPEN FONTS

DISPLAY: OPEN FONTS

PARAMETERS: FILLED   NOT FILLED

DEFAULT: FILLED

LANGUAGES: DM/PL

SET VIA: CONFIGURATION, SERVICE

FUNCTION: The OPEN FONTS menu selects the default fill for the DM/PL fillable text fonts (F1 serif, F2 sans serif, F3 serif bold, and F4 sans serif bold).

GENERAL: Selecting FILLED causes the fillable fonts to have a default solid fill when plotted. Other fill patterns can be selected by the host computer software. Selecting NOT FILLED causes all fillable fonts to be plotted as outlined characters. See Figure 7–3.

Non–fillable fonts (F0 single stroke, F5 ISO drafting, and F6 script) are not affected by this parameter. If LANGUAGE is set as HP-GL or HP-GL/2, this parameter has no effect — all characters are non–fillable.

<div align="center">

Text Fill On
Text Fill Off

</div>

FIGURE 7–3. OPEN FONTS

7.30   ZERO CHARACTER

DISPLAY: ZERO CHAR

PARAMETERS: PLAIN   SLASH   DOTTED

DEFAULT: PLAIN

LANGUAGES: DM/PL, HP-GL, HP-GL/2

SET VIA: CONFIGURATION, SERVICE

FUNCTION: The ZERO CHAR menu allows you to select among three different types of zero text characters (0).

GENERAL: See Figure 7–4. For DM/PL, this menu setting is ignored for the Katakana G8 character set. For HP-GL, this menu setting is ignored for the Special Symbols 5, 15, and 25; Roman Extensions 7, 17, and 27; and Katakana 8, 18, and 28 character sets.

Dotted Zero: 0
Slashed Zero: Ø
Plain Zero: 0

FIGURE 7–4. ZERO CHARACTER

7.31   BAUD RATE

DISPLAY: BAUD RATE

PARAMETERS: 2400   4800   9600   19200   38400

DEFAULT: 9600

LANGUAGES: DM/PL, HP-GL, HP-GL/2

SET VIA: CONFIGURATION, SERVICE

FUNCTION: The BAUD RATE menu selects the operating baud rate for RS–232–C serial communications for your plotter.

NOTE

The plotter baud rate selection MUST MATCH the host computer baud rate setting.

GENERAL: Five different baud rates are available. If possible, configure your plotting software to the fastest rate it supports from this menu.

7.32   PARITY

DISPLAY: PARITY

PARAMETERS: NONE   MARK   EVEN   ODD

DEFAULT: EVEN

LANGUAGES: DM/PL, HP-GL, HP-GL/2

SET VIA: CONFIGURATION, SERVICE

FUNCTION: The PARITY menu selects the byte format and parity type for RS–232–C serial communications for your plotter.

NOTE

The plotter parity selection MUST MATCH the host computer parity setting.

GENERAL: NONE specifies no parity, eight input data bits, and bit eight set to zero for data output from the plotter.   MARK specifies no parity, eight data bits, and bit eight set to one for output. EVEN specifies seven data bits with even parity as the eighth bit. ODD specifies seven data bits with odd parity as the eighth bit. Select the parity setting required by your host computer.

7.33   RTS/DTR (HANDSHAKING)

DISPLAY: RTS/DTR

PARAMETERS: TOGGLE   HIGH

DEFAULT: HIGH

LANGUAGES: DM/PL, HP-GL, HP-GL/2

SET VIA: CONFIGURATION, SERVICE

FUNCTION: The RTS/DTR menu controls the plotter's RS–232–C serial communications data connector Request To Send (RTS) and Data Terminal Ready (DTR) signals for hardware handshaking purposes. The plotter's RS–232–C interface is explained in Paragraph B.3.

NOTE

The plotter handshaking selection MUST MATCH the host computer handshaking setting.

GENERAL: If your plotting software requires a constant high signal level at these two pins, select the HIGH option (typical setting for XON/XOFF or software handshaking). If your plotting software uses these two pins for hardware handshaking, select the TOGGLE option.

7.34   LINE STATUS

DISPLAY: LINE STATUS

PARAMETERS: STANDALONE   EAVESDROP

DEFAULT: STANDALONE

LANGUAGES: HP-GL, HP-GL/2

SET VIA: CONFIGURATION, SERVICE

FUNCTION: The LINE STATUS menu simulates the function of the STANDALONE EAVESDROP switch on HP model 758X plotters. This determines how the plotter is selected by the host computer.

NOTE

The line status selection MUST match the plotting software.

GENERAL: STANDALONE means that the plotter is always programmed–on at power up. EAVESDROP means that the plotter is in a programmed–off condition at power up and must be explicitly selected with a programmed–on command by the plotting software. Set this to match your plotting software.

7.35 DM/PL ERRORS

DISPLAY: DM/PL ERRORS

PARAMETERS: IGNORED   REPORTED

DEFAULT: IGNORED

LANGUAGES: DM/PL

SET VIA: CONFIGURATION, SERVICE

FUNCTION: The DM/PL ERRORS menu allows the plotter to use its control panel display to report various DM/PL errors, such as illegal plot commands, invalid parameter ranges, or communications errors.

GENERAL: This feature is activated by selecting REPORTED. It is usually used only when attempting to debug a communication link between the plotter and the host computer. If this feature is used, be sure the plotting software does not use automatic baud rate selection (auto–baud). Otherwise, auto–baud will trigger baud rate errors as it attempts to match baud rates. After a link is established, this feature can be disabled by selecting IGNORED.

7.36 CHART COMMANDS

DISPLAY: CHART CMNDS

PARAMETERS: DMP-160 EH/EF   DMP-60 EH/EF

DEFAULT: DMP-160 EH/EF

LANGUAGES: DM/PL

SET VIA: SERVICE

FUNCTION: The CHART CMNDS menu sets the plotter's response to a DM/PL Full Chart EF or Half Chart EH command.

GENERAL: When set to DMP-160 EH/EF, DM/PL Full Chart EF or Half Chart EH commands are ignored if CHART FEED is set to CUT SHEET or MANUAL ROLL. When set to DMP-60 EH/EF, a DM/PL Half Chart EH command sets the origin to the left front of the chart, a DM/PL Full Chart EF command sets the origin to the right front of the chart, and the ORIENTATION menu setting is overridden.

SECTION 8
CLIP & SCALE MENU

8.1 INTRODUCTION

This section provides information for using the CLIP & SCALE menu. Note that this menu is not available if SCAN–CAD is selected as the LANGUAGE in the CONFIGURATION menu (Paragraph 7.19).

8.2 CLIP & SCALE

CLIP & SCALE
ENTER

The CLIP & SCALE menu is used to access the various sub–menus to select the plotter clipping and scaling features. The CLIP & SCALE menu allows you to redefine the plotter's plotting surface. At power up or after a reset, the default settings provide a 1:1 mapping ratio of plot code to the entire chart size presently installed. By using the CLIP & SCALE menu settings, you can locate, scale, clip, and/or mirror your plot anywhere on the chart plotting surface.

8.3 MENU OPERATION

The individual CLIP & SCALE sub–menus are shown in Figure 8–1. To access these sub–menus, press the up arrow or down arrow key at the CLIP & SCALE menu. Press the **ENTER** key to select the desired scale or clip sub–menu.

To go to the present clip or scale point from a sub–menu, press the left arrow or right arrow key until VIEW is displayed, then press the **ENTER** key. To set a new clip or scale point from a sub–menu, press the left arrow or right arrow key until SET is displayed, then press the **ENTER** key. Use the left arrow, right arrow, up arrow, or down arrow key to move to a new point. Press the **ENTER** key again to select that point.

To select another menu, press the **MENU** key. To load a chart or reset the plotter, press the **RESET/LOAD** key. To return to online, press the **ONLINE** key.
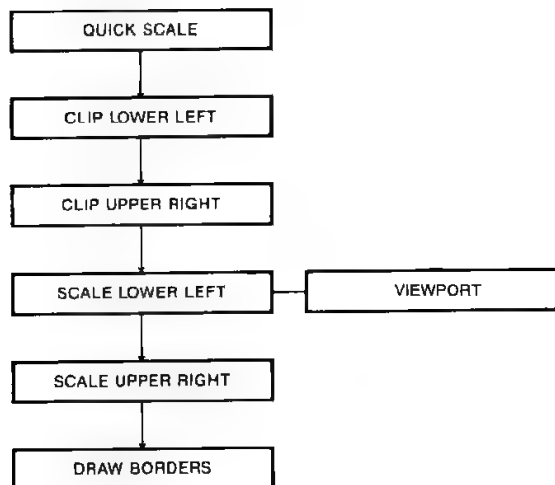
FIGURE 8–1. CLIP AND SCALE

8.4   QUICK SCALE

OFF
ENGR A   ENGR B   ENGR C   ENGR D   ENGR E
ARCH A   ARCH B   ARCH C   ARCH D   ARCH E   ARCH F   30X42
A4 DIN   A3 DIN   A2 DIN   A1 DIN   A0 DIN   B1 DIN
A4 OVRSZ   A3 OVRSZ   A2 OVRSZ   A1 OVRSZ   A0 OVRSZ

Use the QUICK SCALE menu to set up automatic plot scaling. A plot may be enlarged or reduced in size. The aspect ratio of the original plot is maintained during scaling (circles will still be circles after scaling). QUICK SCALE is intended for use with standard size plots and charts; for other sizes, see information on clipping and scaling in the following paragraphs.

To scale a plot, the plotter must know the original plot size and the final plot size. The final plot size will be set by the chart size automatically detected by the plotter during the last LOAD operation. The user must indicate the original plot size by selecting a size from those presented in the menu. Selecting an original size smaller than the presently loaded chart will enlarge the original plot to fill the present chart as much as possible without changing the plot aspect ratio. Selecting an original size larger than the presently loaded chart will reduce the original plot to fill the present chart as much as possible without changing the plot aspect ratio. Selecting an original size equal to the presently loaded chart size or selecting OFF (the default selection) will result in no scaling.

In the display, ENGR represents Engineering sizes, ARCH represents Architectural sizes, DIN represents DIN sizes, and OVRSZ represents oversize DIN sizes. 30x42 represents a standard Architectural size of 30 by 42 inches.

For example, you have an Engineering B size plot that you wish to reduce to Engineering A size chart for a report. See Figure 8–2. Load an Engineering A size chart. At this menu, select ENGR B for QUICK SCALE. Exit the menu and send the plot code to the plotter to produce a scaled down version of the plot. See Figure 8–3.

The plotting software can also scale a drawing using the DM/PL Window W command or HP-GL or HP-GL/2 Scale SC command.

HOUSTON INSTRUMENT

PEN PLOTTER

FIGURE 8–2. ORIGINAL PLOT

HOUSTON INSTRUMENT

PEN PLOTTER

FIGURE 8–3. QUICK SCALE PLOT

8.5   CLIP

CLIP LL
SET VIEW
< ↑ ↓ > : ENTER

CLIP UR
SET VIEW
< ↑ ↓ > : ENTER

The CLIP LL and CLIP UR sub–menus are used to establish the lower left and upper right corner clip points for a clip plot.

The subpart of a plot design selected for plotting is called a clip. A clip is created by specifying an imaginary rectangle around a subpart using two corner points, called the lower left (LL) and the upper right (UR). Figure 8–4 shows the default locations of these points, which vary with chart orientation. The sides of the imaginary rectangle are called clip limits. Only the plot codes within the specified clip limits are plotted when the plotting program is run. Thus, only the subpart, or clip, appears on the chart.

FULL SIZE CHART

UPPER RIGHT

LOWER LEFT

HALF SIZE CHART

UPPER RIGHT

LOWER LEFT

FIGURE 8–4. LOWER LEFT AND UPPER RIGHT POINTS

During a clip plot, the pen may pause for various lengths of time. This is normal and does not indicate a problem with the plotter. The plotter still receives the plot codes for the entire plot, but draws only the data for the plot that is inside the limits. That is, plotting activity pauses whenever the plotter receives data that falls outside the clip limits.

The clip setting defaults to the entire plotting area when the plotter is powered on or reset. The default clip limit is the same as the scale limit, which produces a "normal" plot. Clip is not affected by using the **RESET/LOAD** key to LOAD a chart of the same size or ABORT a plot. However, clip is canceled by using the **RESET/LOAD** key to RESET the plotter or if the plotter is powered off. Also, refer to Paragraph A.3 to see how menu item selection affects a clip.

To set a clip:

1.   Run the plot that you wish to clip. Leave the chart in the plotter.

2.   Press the **MENU** key until the CLIP & SCALE menu is displayed, then press the **ENTER** key.

3.   Press the up arrow or down arrow key until CLIP LL is displayed, then press the **ENTER** key. At the CLIP LL sub–menu, press the left arrow or right arrow key to display VIEW. Press the **ENTER** key to move to the present lower left clip point. Use the left arrow, right arrow, up arrow, or down arrow key to move to the desired clip lower left point. Press the **ENTER** key to select that point as the new clip lower left point.

4.   Press the up arrow or down arrow key until CLIP UR is displayed, then press the **ENTER** key. At the CLIP UR sub–menu, press the left arrow or right arrow key to display VIEW. Press the **ENTER** key to move to the present upper right clip point. Use the left arrow, right arrow, up arrow, or down arrow key to move to the desired clip upper right point. Press the **ENTER** key to select that point as the new clip upper right point.

5.   If desired, set a scale as described in Paragraph 8.6.

6.   Press the **RESET/LOAD** key one time. Remove the old chart and install a new chart. Press the left arrow or right arrow key until LOAD is displayed, then press the **ENTER** key to load the new chart. **DO NOT** select RESET since that will clear any clip setting in effect.

7.   Send the plot code again to plot only the clip.

8.   Press the **RESET/LOAD** key one time. Press the left arrow or right arrow key until RESET is displayed, then press the **ENTER** key to clear the clip setting.

For example, consider clip points set on an original plot as shown in Figure 8–5. The resulting clip plot is as shown in Figure 8–6 if no scale is set.

HOUSTON INSTRUMENT

UPPER
RIGHT

PEN PLOTTER
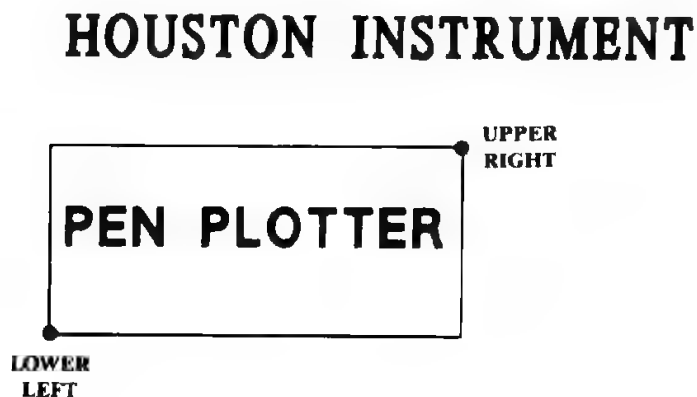
LOWER
LEFT

FIGURE 8–5. CLIP POINTS

PEN PLOTTER

FIGURE 8–6. CLIP PLOT

8.6   SCALE

SCALE LL
SET VIEW   SET VIEWPORT
< ↑ ↓ > : ENTER

SCALE UR
SET VIEW
< ↑ ᵥ > : ENTER

The SCALE LL and SCALE UR sub–menus are used to establish the scale lower left and upper right corner points for a plot. These points are also used to set plot mirror effects as described in Paragraph 8.8.   The SCALE LL sub–menu SET VIEWPORT item is used to set a viewport as described in Paragraph 8.7.

.

If you want a plot at a larger or smaller size, or with a different height–to–width ratio (aspect) for a special visual effect, you can specify these changes with the scale function. Like the clip, a scale box is an imaginary rectangle specified by two points called the lower left (LL) and the upper right (UR). Figure 8–4 shows the locations of these points, which vary with chart orientation. The sides of the imaginary rectangle are called scale box limits. If a clip box is set, the scale box is set to the same size to maintain the clip size.

The scale setting defaults to the entire plotting area when the plotter is powered on or reset. The default scale limit is the same as the clip limit, which produces a "normal" plot. Scale is not affected by using the **RESET/LOAD** key to LOAD a chart of the same size or ABORT a plot. However, scale is canceled by using the **RESET/LOAD** key to RESET the plotter or by powering off the plotter. Also, refer to Paragraph A.3 to see how menu item selection affects scale.

NOTE

There is one set of SCALE LL and SCALE UR points. You either set a scale plot or mirror plot (Paragraph 8.8) with these points.

To set a scale:

1.   Run the plot that you wish to scale. Leave the chart in the plotter.

2.   Press the **MENU** key until the CLIP & SCALE menu is displayed, then press the **ENTER** key.

3.   If desired, set a clip as described in Paragraph 8.5 or a viewport as described in Paragraph 8.7.

4. Press the up arrow or down arrow key until SCALE LL is displayed, then press the **ENTER** key. At the SCALE LL sub–menu, press the left arrow or right arrow key to display VIEW. Press the **ENTER** key to move to the present lower left scale point. Use the left arrow, right arrow, up arrow, or down arrow key to move to the desired scale lower left point. Press the **ENTER** key to select that point as the new scale lower left point.

5. Press the up arrow or down arrow key until SCALE UR is displayed, then press the **ENTER** key. At the SCALE UR sub–menu, press the left arrow or right arrow key to display VIEW. Press the **ENTER** key to move to the present upper right scale point. Use the left arrow, right arrow, up arrow, or down arrow key to move to the desired scale upper right point. Press the **ENTER** key to select that point as the new scale upper right point.

6. Press the **RESET/LOAD** key one time. Remove the old chart and install a new chart. Press the left arrow or right arrow key until LOAD is displayed, then press the **ENTER** key again to load the new chart. **DO NOT** select RESET since that will clear any scale setting in effect.

7. Send the plot code again to plot the scaled plot.

8. Press the **RESET/LOAD** key one time. Press the left arrow or right arrow key until RESET is displayed, then press the **ENTER** key to clear the scale setting.

For example, consider clip points set on an original plot as shown in Figure 8–5. If a scale box is set as shown in Figure 8–7, the resulting scale plot is as shown in Figure 8–8. When setting a scale this way, you can alter the aspect ratio of the scale plot if desired.
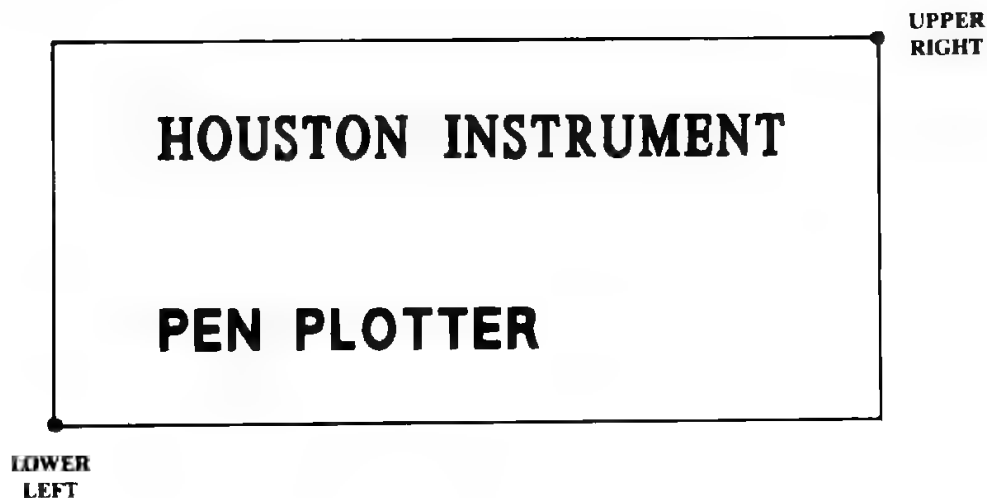
UPPER
RIGHT

HOUSTON INSTRUMENT

PEN PLOTTER

LOWER
LEFT

FIGURE 8–7. SCALE PLOT

PEN PLOTTER

FIGURE 8–8. ENLARGED SCALE PLOT

The most reliable way to maintain the aspect ratio for a plot when scaling is to use the auto–scaling feature. This is done by setting the lower left and upper right points in the same axis. For example, consider clip points set on an original plot as shown in Figure 8–5. If a scale box is set as shown in Figure 8–9, the resulting scale plot is as shown in Figure 8–8.

HOUSTON INSTRUMENT

PEN PLOTTER

LOWER
LEFT

UPPER
RIGHT

OR

UPPER
RIGHT

HOUSTON INSTRUMENT

PEN PLOTTER
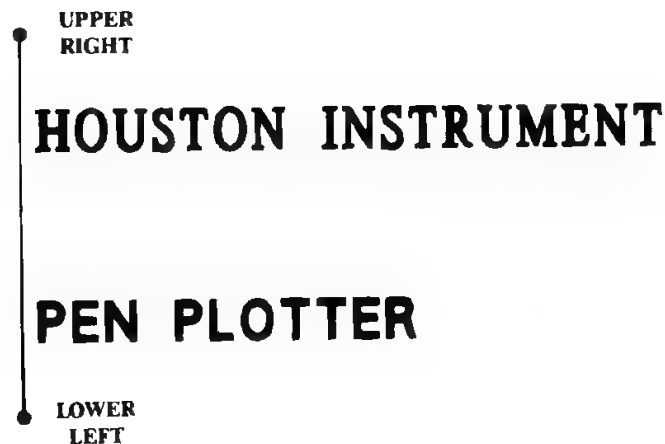
LOWER
LEFT

FIGURE 8–9. AUTO–SCALE PLOT

8.7 VIEWPORT

SCALE LL
SET VIEW   SET VIEWPORT
< ↑ ↓ > : ENTER

You can decide where on the chart to place a plot by selecting a viewport. This is done by specifying where the lower left corner (origin) of the plot is to be. The point that selects the viewport is specified with the SCALE LL sub–menu SET VIEWPORT item. By moving the pen holder as the viewport, or lower left corner of the plot, you determine the location for a plot when the plot code is sent.

The viewport feature can be used with the clip feature to reproduce a small portion of a plot several times on the same chart. It is also possible to use the viewport feature to reproduce an entire plot intended for a smaller chart several times on a single larger chart. The clip feature described in Paragraph 8.5, scale or auto–scale features described in Paragraph 8.6, and mirror effects described in Paragraph 8.8 can also be used with the viewport.

The viewport defaults to the lower left corner of the plotting area when the plotter is powered on or reset, or to the lower left clip corner when a clip is set. A viewport setting is not affected by using the **RESET/LOAD** key to LOAD a chart of the same size or ABORT a plot. However, a viewport setting is canceled by using the **RESET/LOAD** key to RESET the plotter or if the plotter is powered off. Also, refer to Paragraph A.3 to see how menu item selection affects a viewport.

To set a viewport:

1.   Press the **MENU** key until the CLIP & SCALE menu is displayed, then press the **ENTER** key.

2.   If desired, set a clip as described in Paragraph 8.5, set scaling as described in Paragraph 8.6, or set a mirror effect as described in Paragraph 8.8.

3.   Press the up arrow or down arrow key until SCALE LL is displayed, then press the **ENTER** key. At the SCALE LL sub–menu, press the left arrow or right arrow key to display SET VIEWPORT. Press the **ENTER** key to select the SET VIEWPORT option. Use the left arrow, right arrow, up arrow, or down arrow key to move to the desired viewport. Press the **ENTER** key to select that point as the new lower left corner of the viewport.

4.   If loading a new chart, press the **RESET/LOAD** key one time. Remove the old chart and install a new chart. Press the left arrow or right arrow key until LOAD is displayed, then press the **ENTER** key again to load the new chart. **DO NOT** select RESET since that will clear any viewport setting in effect.

5.   Send the plot code to plot at the new viewport.

6.   Press the **RESET/LOAD** key one time. Press the left arrow or right arrow key until RESET is displayed, then press the **ENTER** key to clear the viewport setting.

For example, consider clip points set on an original plot as shown in Figure 8–5. If one viewport is set as shown in Figure 8–10 and the plot code sent, then another viewport is set and the plot code sent again, the resulting plot will contain the two clips positioned as shown.

PEN PLOTTER   PEN PLOTTER

●   ●
FIRST   **SECOND**
VIEWPORT   **VIEWPORT**

FIGURE 8–10. VIEWPORT PLOT

8.8 MIRROR PLOT

SCALE LL
SET VIEW   SET VIEWPORT
< ↑ ↓ > : ENTER

SCALE UR
SET VIEW
< ↑ ↓ > : ENTER

The mirror plot feature is produced with scaling points. This is done by altering the relative positions of the scale lower left and upper right points. Figure 8–11 shows how the scale lower left and upper right points are set in various combinations to produce normal, reverse, upside–down, and reverse upside–down plots (in all cases the window or clip lower left and upper right points are in their normal positions).

NORMAL:

SCALE
UPPER
RIGHT

PEN PLOTTER

SCALE
LOWER
LEFT

SCALE
UPPER
RIGHT

REVERSE:

ЯƎTTOⱵ ИƎꟼ

SCALE
LOWER
LEFT

UPSIDE-DOWN:

SCALE
LOWER
LEFT

ЯƎTTOⱵ ИƎꟼ

SCALE
UPPER
RIGHT

SCALE
LOWER
LEFT

REVERSE UPSIDE-DOWN:

ꟼƎИ ⱵⱵOTTƎЯ

SCALE
UPPER
RIGHT
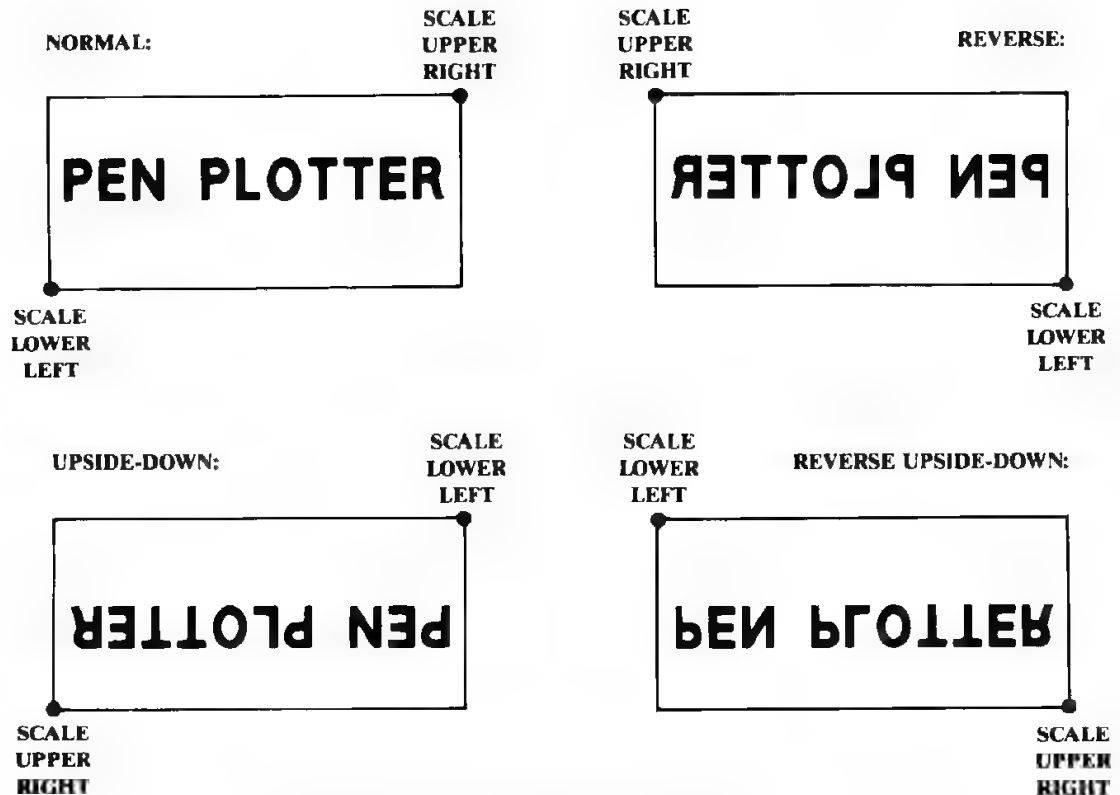
FIGURE 8–11. MIRROR OPTIONS

The mirror setting defaults to normal orientation when the plotter is powered on or reset. A mirror setting is not affected by using the **RESET/LOAD** key to LOAD a chart of the same size or ABORT a plot. However, a mirror setting is canceled by using the **RESET/LOAD** key to RESET the plotter or if the plotter is powered off. Also, refer to Paragraph A.3 to see how menu item selection affects mirror.

NOTE

There is one set of SCALE LL and SCALE UR points. You either set a scale plot or mirror plot with these points.

To set a mirror plot:

1. Run the plot that you wish to mirror. Leave the chart in the plotter.

2. Press the **MENU** key until the CLIP & SCALE menu is displayed, then press the **ENTER** key.

3. If desired, set a clip as described in Paragraph 8.5 or a viewport as described in Paragraph 8.7.

4. Press the up arrow or down arrow key until SCALE LL is displayed, then press the **ENTER** key. At the SCALE LL sub–menu, press the left arrow or right arrow key to display VIEW. Press the **ENTER** key to move to the present lower left scale point. Use the left arrow, right arrow, up arrow, or down arrow key to move to the desired scale lower left point as shown in Figure 8–11 for a normal, reverse, upside–down, or reverse upside–down plot. Press the **ENTER** key to select that point as the new scale lower left point.

5. Press the up arrow or down arrow key until SCALE UR is displayed, then press the **ENTER** key. At the SCALE UR sub–menu, press the left arrow or right arrow key to display VIEW. Press the **ENTER** key to move to the present upper right scale point. Use the left arrow, right arrow, up arrow, or down arrow key to move to the desired scale upper right point as shown in Figure 8–11 for a normal, reverse, upside–down, or reverse upside–down plot. Press the **ENTER** key to select that point as the new scale upper right point.

6. Press the **RESET/LOAD** key one time. Remove the old chart and install a new chart. Press the left arrow or right arrow key until LOAD is displayed, then press the **ENTER** key again to load the new chart. **DO NOT** select RESET since that will clear any mirror setting in effect.

7.   Send the plot code again to plot the mirror plot.

8.   Press the **RESET/LOAD** key one time. Press the left arrow or right arrow key
        until RESET is displayed, then press the **ENTER** key to clear the mirror setting.

For example, consider clip points set on an original plot as shown in Figure 8–5. If a scale
box is set as shown in Figure 8–12, the resulting reversed mirror plot is as shown in Figure
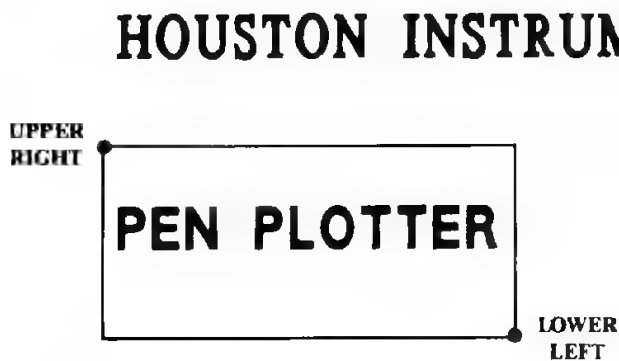8–13.

HOUSTON INSTRUMENT

UPPER
RIGHT

PEN PLOTTER

LOWER
LEFT

FIGURE 8–12. MIRROR PLOT

ЯƎTTO⅃9 ИƎ9

FIGURE 8–13. REVERSED MIRROR PLOT

The scale, auto–scale, and mirror features can also be applied to reduce a plot. This is done by making the scale box smaller than the clip box (if set) or smaller than the plot area if a clip is not set. For example, consider clip points set on an original plot as shown in Figure 8–5. If a scale box is set as shown in Figure 8–14, the resulting reduced scale plot is as shown in Figure 8–15.

HOUSTON INSTRUMENT

PEN PLOTTER

LOWER   **UPPER**
LEFT   **RIGHT**
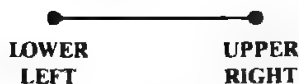
FIGURE 8–14. SCALE PLOT

PEN PLOTTER

FIGURE 8–15. REDUCED PLOT

8.9   DRAW BORDERS

DRAW BORDERS
CLIP WINDOW   VIEWPORT

The DRAW BORDERS sub–menu is used to draw the border of the present clip window or viewport, if so desired. This function is useful for precise verification of clip and viewport settings.

To draw the borders:

1. Set a clip as described in Paragraph 8.5 and/or a viewport as described in Paragraph 8.7.

2. Press the **MENU** key until the CLIP & SCALE menu is displayed, then press the **ENTER** key.

3. Press the up arrow or down arrow key until DRAW BORDERS is displayed, then press the **ENTER** key. At the DRAW BORDERS sub–menu, press the left arrow or right arrow key to display CLIP WINDOW. Press the **ENTER** key to draw a border around the present clip window.

4. At the DRAW BORDERS sub–menu, press the left arrow or right arrow key to display VIEWPORT. Press the **ENTER** key to draw a border around the present viewport.

5. Press the **ONLINE** key to resume online operation.

For example, consider clip points set on an original plot as shown in Figure 8–5. If the CLIP WINDOW or VIEWPORT item is selected in the DRAW BORDERS menu, the plot looks like Figure 8–16.

HOUSTON INSTRUMENT

PEN PLOTTER

FIGURE 8–16. DRAW BORDERS EXAMPLE

SECTION 9
INTERNAL PLOTS MENU

9.1   INTRODUCTION

This section provides information for using the internal plots menu. Note that this menu is not available if SCAN–CAD is selected as the LANGUAGE in the CONFIGURATION menu (Paragraph 7.19).

9.2   MENU OPERATION

To access an internal plot:

1.   Power on the plotter and load a chart.

2.   Load the pen(s).

3.   Press the **MENU** key until the INTERNAL PLOTS menu is displayed, then press the **ENTER** key.

4.   Press the left arrow or right arrow key to display the desired internal plot. Press the **ENTER** key to perform the plot.

To exit this menu for another menu, press the **MENU** key until the desired menu is displayed. To exit any menu and return to the online condition, press **ONLINE**. To load a chart or reset the plotter, press the **RESET/LOAD** key.

9.3   INTERNAL PLOTS

INTERNAL PLOTS MENU
MENU PLOT   CONFIDENCE   DIN PLOT   FONT DEMO

The INTERNAL PLOTS menu is used to plot various resident plots provided for informational purposes. The plotter need not be connected to the host computer to use these resident plots.

A chart must be loaded prior to using the INTERNAL PLOTS menu for plotting. Otherwise, the plotter displays a CHART NOT LOADED or TEST RUNNING message.

The various internal plots are described in the following paragraphs.

9.4   MENU PLOT

The MENU PLOT is a hard copy of the present plotter configuration (the items selected while using the CONFIGURATION menus described in Section 7). The plot is organized by menu categories to show the present values for the various USER SELECT configurations (Section 5). Load an Engineering A–size or larger chart and pen 1 for this plot. It is highly recommended that you perform a MENU PLOT whenever the plotter configuration is altered. This plot should be kept with the plotter documentation to inform other users of the present configurations. Figure 9–1 shows an example MENU PLOT. Note that your menu plot may vary considerably from this example, depending upon your selected configuration.

DMP162   1358001 1359001 1351001
CURRENT USER: 3

PARAMETER	USER_1	USER_2	USER_3	USER_4
PEN 1 VELOCITY	600 MM/S	600 MM/S	16 IPS	
PEN 2 VELOCITY	600 MM/S	600 MM/S	16 IPS	
PEN 3 VELOCITY	600 MM/S	600 MM/S	16 IPS	
PEN 4 VELOCITY	600 MM/S	600 MM/S	16 IPS	
PEN 5 VELOCITY	400 MM/S	600 MM/S	16 IPS	
PEN 6 VELOCITY	400 MM/S	600 MM/S	16 IPS	
PEN 7 VELOCITY	400 MM/S	400 MM/S	16 IPS	
PEN 8 VELOCITY	400 MM/S	400 MM/S	16 IPS	
PEN 1 TIP SIZE	.35MM	.35MM	.35MM	
PEN 2 TIP SIZE	.35MM	.35MM	.35MM	
PEN 3 TIP SIZE	.35MM	.35MM	.35MM	
PEN 4 TIP SIZE	.35MM	.35MM	.35MM	
PEN 5 TIP SIZE	.70MM	.35MM	.35MM	
PEN 6 TIP SIZE	.70MM	.35MM	.35MM	
PEN 7 TIP SIZE	.70MM	.70MM	.35MM	
PEN 8 TIP SIZE	.70MM	.70MM	.35MM	
VEL OVERRIDE	HOST CONTROL	HOST CONTROL	IGNORE HOST	
PEN ACCEL	4.0g	4.0g	2.0g	
MEDIA VEL	600 MM/S	600 MM/S	16 IPS	
# OF PENS	8	8	6	
PENS/GROUP	4	2	1	
LANGUAGE	HP–GL	HP–GL/2	DM/PL	SCAN–CAD
OPTIMIZATION	ON	ON	OFF	
MENU UNITS			ENGLISH	
AUTO–CAPPING	15 S	30 S	120 S	
PEN PAUSE	DISABLE	DISABLE	DISABLE	
ORIENTATION	NORMAL	NORMAL	NORMAL	
ADDRESSING			.001 INCH	
TEXT FONT			F0	
TEXT SPACING			PROP.	
CHAR SET			G0	
OPEN FONTS			FILLED	
ZERO CHAR	PLAIN	SLASH	PLAIN	
BAUD RATE	9600	19200	38400	
PARITY	EVEN	EVEN	NONE	
RTS/DTR	HIGH	HIGH	TOGGLE	
LINE STATUS	STANDALONE	STANDALONE		
DM/PL ERRORS			IGNORED	

FIGURE 9–1. MENU PLOT

9.5   CONFIDENCE PLOT

The CONFIDENCE plot performs an electrical and mechanical test of the plotter. It can be used to verify that the plotter is operational. Figure 9–2 shows an example CONFIDENCE plot. Any size chart can be used for this plot. Be sure to load pens 1 through 4 for this plot.
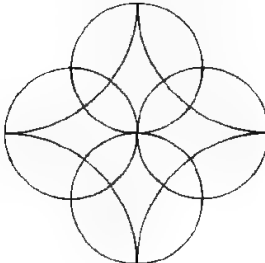
FIGURE 9–2. CONFIDENCE PLOT

9.6   DIN PLOT

The DIN PLOT also performs an electrical and mechanical test of the plotter. It is often used to verify plot quality. Note that the time required to draw the single pen portion of the plot is included as "PLOT TIME" so that you can see the effects that different pen down velocity and acceleration combinations have on plot time. Figure 9–3 shows an example DIN PLOT. It is important to note that this plot is always drawn at DIN A4 size, regardless of the actual chart size installed. If a smaller chart is loaded, part of the outer box will be clipped (not drawn). Be sure to load pens 1 through 4 for this plot. This plot is always drawn in the order prescribed by the ISO DIN standard, regardless of the OPTIMIZATION configuration menu setting.

houston instrument DMP-160 SERIES PLOTTER
velocity: 24 IPS   accel: 2.0g   PLOT TIME: 67 sec.
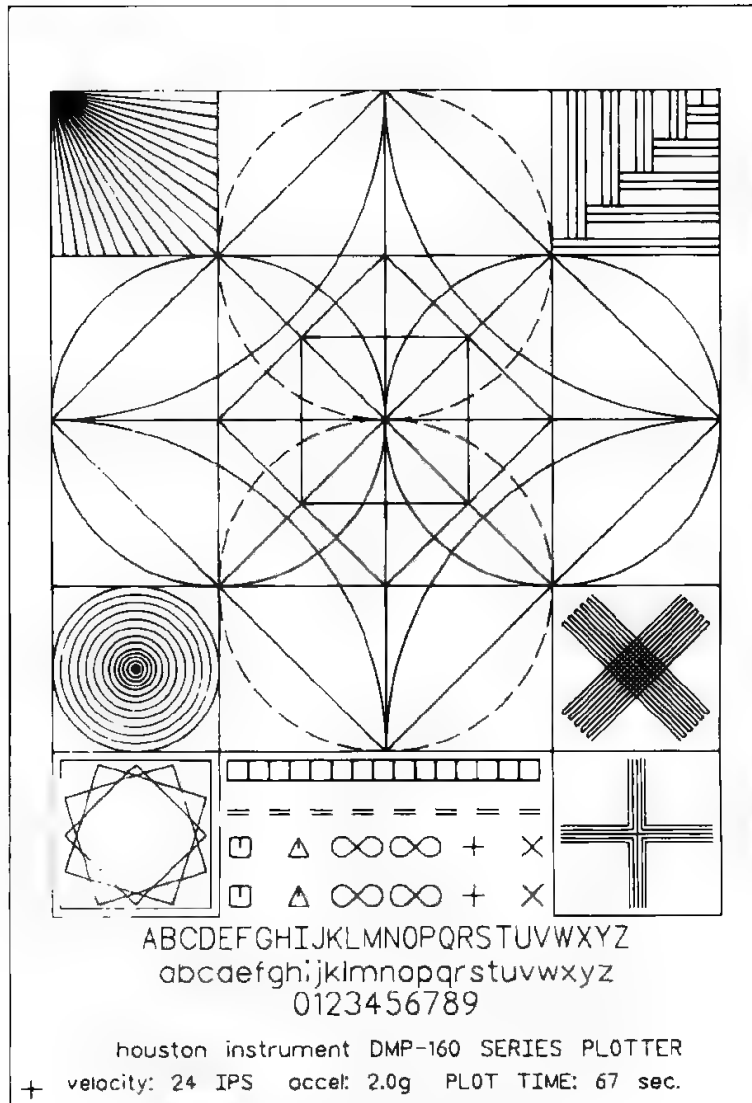
FIGURE 9–3. DIN PLOT

9.7 FONT DEMO PLOT

The FONT DEMO plot shows the various DM/PL character set characters (symbols) and fonts (character styles) available for this plotter. See Figure 9–4. Be sure to load an Engineering B–size or larger chart and pen 1 for this plot. Loading a smaller chart causes the serif, sans serif, serif bold, and sans serif bold fonts to plot as single stroke.

FIGURE 9–4. FONT DEMO

SECTION 10
SERVICE MODE MENU

10.1   INTRODUCTION

This section provides information for using the SERVICE MODE menu.

It is important to note that the SERVICE MODE menu is a special set of procedures for use as needed — this menu is NOT displayed or needed for normal operation of the plotter. When in SERVICE MODE, the plotter is fully functional and operates as described elsewhere in this manual.

When the SERVICE MENU is active, additional sub–menu items are available in the CONFIGURATION menu (see Section 7).

10.2   MENU OPERATION

To access a SERVICE MODE test or plot:

1.   Power the plotter off.

2.   Power the plotter on. Put your fingers over the **ONLINE** and and **RESET/LOAD** keys. The RAM SIZE is displayed during the memory test (this may take several seconds, depending upon the size of the buffer). When the message changes and the plotter beeps, simultaneously press and hold the **ONLINE** and **RESET/LOAD** keys until the plotter beeps again (about two seconds).

        Notice that an "S" is displayed in the upper right corner of the control panel display at all times to indicate that the SERVICE MODE menu is available.

3. Load a chart and pen(s).

4. Press the **MENU** key until the SERVICE MODE menu is displayed, then press the **ENTER** key.

5. Press the left arrow or right arrow key to display the desired plot or test routine. Press the **ENTER** key to perform the selected item.

6. To cancel SERVICE MODE, power off the plotter.

To exit this menu for another menu, press the **MENU** key until the desired menu is displayed. To exit any menu and return to the online condition, press **ONLINE**. To load a chart or reset the plotter, press the **RESET/LOAD** key.

10.3   SERVICE MODE

SERVICE MODE
SERVICE PLOT   PAPER SENSOR   MP–80 INSTALL   PEN–PEN TEST
PEN LIFT SETUP   TRACKING TEST   FRICTION PLOT   RS232 TEST
DRAM TEST   INSTALL MENU

The SERVICE MODE menu is used to access various resident test routines and plots for service purposes. The plotter need not be connected to the host computer to use these resident plots.

A chart must be loaded prior to using the SERVICE MODE menu plots. Otherwise, the plotter goes to ONLINE mode and displays a SHEET NOT LOADED message.

The various internal service plots and tests are described in the following paragraphs.

10.4   SERVICE PLOT

The SERVICE PLOT provides you with information about the plotter, which is helpful when requesting service for your plotter. The SERVICE PLOT is always plotted at the same size. This test requires pen 1 in the pen changer. See Figure 10–1. Note that your plot will vary from this example according to your model and configuration.

The plot shows the plotter model number, the revision numbers of the installed ROM (read only memory) circuits, the selected baud rate, the resolution, and buffer (memory) size.

```
REV: (DMP162    1358001 1359001 1351001)    38400 BAUD    ADDRESSING: .001 INCH
DM/PL BUFFER: 4080K
```

FIGURE 10–1. SERVICE PLOT

10.5   PAPER SENSOR

PAPER SENSOR
1 . . . 3* . . . 25

The PAPER SENSOR menu is used to alter the sensitivity of the chart sensor to optimize operation with a particular media. If the plotter has chart loading errors, adjust this menu for a different value. Use the left arrow or right arrow key to select a new value, then press the **ENTER** key. No chart or pens are required for this SERVICE MODE menu item.

10.6 MP–80 INSTALL

The MP–80 INSTALL routine tests the pen changer alignment, optical sensors, and pen change capability. This test requires pens 1 through 8 in the pen changer.

When this test is selected, the plotter moves its pen holder in front of pen stall 1. If the pen holder favors one side or the other of pen stall 1, loosen the two captive screws that secure the pen changer to the plotter and adjust the pen changer slightly left or right, then tighten the captive screws.

CAUTION

Testing of the optical sensors in the pen changer requires you to manually move the arm assembly forward and backward. To prevent permanent damage to the plotter or pen changer, grasp the pen changer base with one hand and push or pull the arm assembly with the other hand.

The plotter displays the ↑ ↓ MANUALLY MOVE prompt when it is ready to test the optical sensors in the pen changer.

1.   Remove the pens from the pen changer.

2.   Manually slide the pen changer arm forward until CHANGER OUT is displayed on the control panel. This indicates that the unit's rear sensor is uncovered and the front sensor is covered.

3.   Manually push the pen changer arm backward until it is centered between full out and full in. The control panel displays PARTIALLY IN. This indicates that both the front and rear sensors are uncovered.

4.   Manually slide the pen changer arm backward until CHANGER IN is displayed on the control panel. This indicates that the front sensor is uncovered and the rear sensor is covered.

5. Manually slide the pen changer arm forward until CHANGER OUT is displayed on the control panel.

6. Install pens in the pen changer, then press the ENTER key. The plotter then cycles through eight pen changes to test the pen changer. If the plotter is configured for less than eight pens, the pen changes are mapped as explained in Paragraph 7.17.

If you received the correct displays during this test, the optical sensors in the pen changer are operating correctly. If the pens cycled correctly, the pen changer is operational.

10.7 PEN–PEN TEST

The PEN–PEN TEST routine tests the pen changing capability and pen–to–pen plotting repeatability of the pen changer. The PEN–PEN TEST is always plotted at the same size. This test requires pens 1 through 8 in the pen changer. The following steps explain how to use this test.

1. Load any size chart. Load eight pens in the pen changer.

2. At the PEN–PEN TEST menu, press the **ENTER** key to start the test. The pen changer cycles through all eight pens and draws a cross with each pen as shown in Figure 10–2.

3. The test automatically stops upon completion.
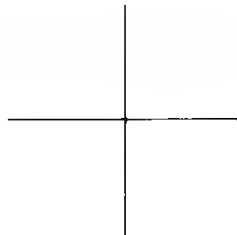
FIGURE 10–2. PEN–PEN TEST

10.8 PEN LIFT SETUP

The PEN LIFT SETUP test is used by Houston Instrument Service Personnel when making pen lift adjustments to the plotter. This test is not used for normal operation.

Load any size chart and pen 1 prior to starting this test. Press the **ENTER** key when PEN LIFT SETUP is displayed. The pen holder is lowered by pressing the down arrow key and raised by pressing the up arrow key. The auto–up time is inhibited during this routine, therefore the pen remains in the down position until it is toggled to the up position. The pen holder is moved left and right with the left arrow and right arrow keys. To exit this routine, press the **ENTER** key.

10.9 TRACKING TEST

The TRACKING TEST verifies proper chart tracking for plotting. The TRACKING plot is automatically scaled to fit the presently installed chart size. This test requires pen 1 in the pen changer. The following steps explain how to use this test.

1.   Load a chart and pen 1.

2.   At the TRACKING TEST menu, press the **ENTER** key to start the test. The test draws a border (Figure 10–3); over–plots the four corners of the border; draws a cross in the lower right area of the chart; draws a cross in the upper left area of the chart; draws a series of down vectors one–fifth the length of the chart in the X direction and 0.1 inch (2.54 mm) in width in the Y direction; and then over–plots the two crosses in the lower right and upper left areas of the chart.

3.   The test automatically stops upon completion. Proper alignment of the over–plotted areas verifies plotter tracking.
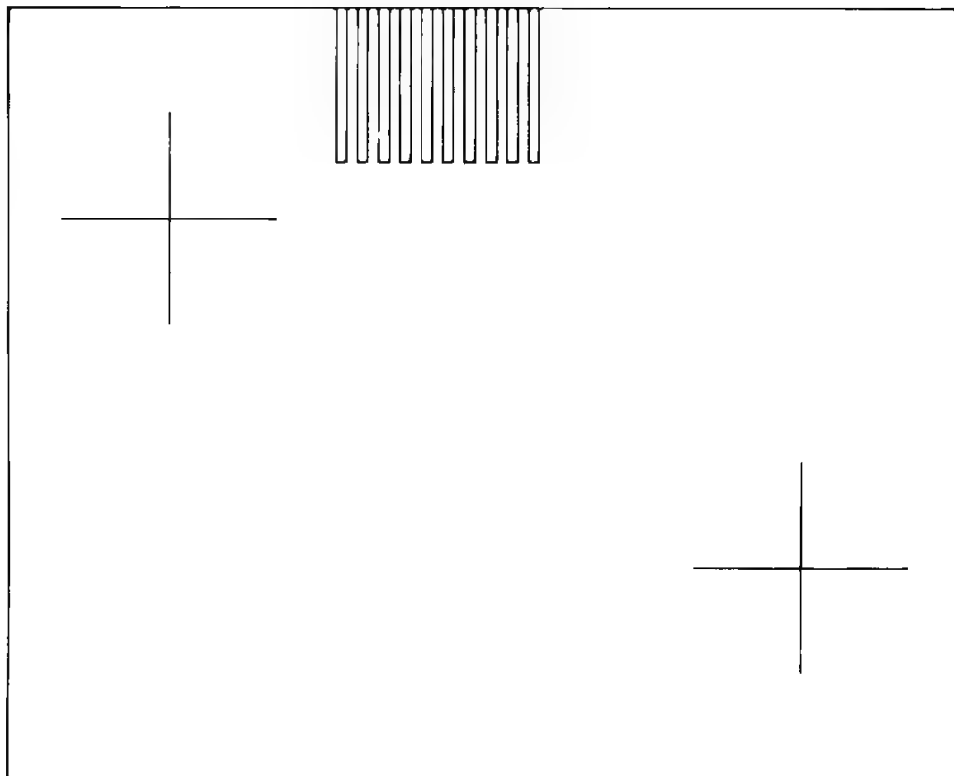
FIGURE 10–3. TRACKING TEST

10.10   FRICTION PLOT

The FRICTION PLOT routine is used by Houston Instrument Service Personnel when diagnosing possible problems with the plotter. The FRICTION PLOT is automatically scaled to fit the presently installed chart size. This test requires pen 1 in the pen changer. This test is not used for normal operation.

Load a pen and the largest chart size for the plotter (Oversize DIN A1 for the DMP-161, Architectural E for the DMP-162 or DMP-162R). To start this test, press the **ENTER** key when FRICTION PLOT is displayed. The plotter then draws a line and a friction map in each axis. See Figure 10-4.
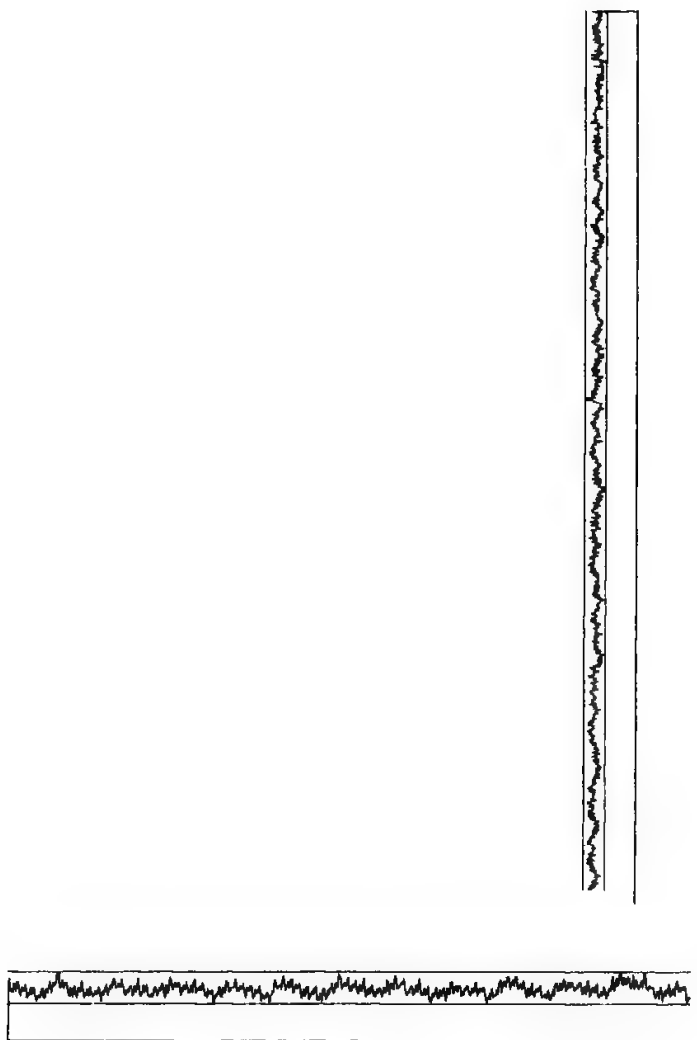
FIGURE 10–4. FRICTION PLOT

10.11   RS232 TEST

The RS232 TEST routine verifies that the plotter's RS–232–C serial communications (transmit data, receive data, and hardware handshaking) circuits are functioning properly. This test does not require that a chart or pens be loaded.

1.   Disconnect the data cable from the plotter bottom panel RS–232–C data connector.

2.   Connect plotter data connector pin 2 to pin 3, and connect plotter data connector pin 4 to pin 5. This can be done by making a loopback test cable as shown in Figure 10–5.

3.   Press the **ENTER** key at the RS232 TEST display to start the test. The plotter transmits and receives data at each available baud rate and parity setting. The length of each transmission varies because of the different baud rates. It then checks the hardware handshake lines.

4.   Upon completion of the test, remove the loopback test cable from the plotter bottom panel RS–232–C connector. Connect the data cable to the plotter data connector.

DB-25S
CONNECTOR

TO
PLOTTER

2   TD
3   RD
4   RTS
5   CTS
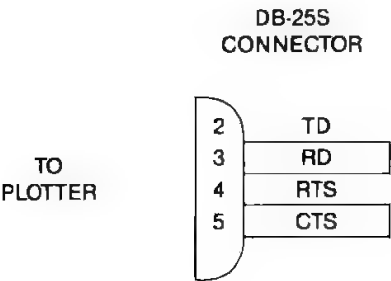
NOTES:
1. Unlisted pins are not connected.

FIGURE 10–5. LOOPBACK CABLE

If an error is detected, the plotter displays one of the error messages listed below.

- **TRANSMIT ERROR.** This indicates that data is received, but does not match the data transmitted. This implies that the line drivers are functioning properly, but excessive noise is occurring on the RS–232–C line. Service is therefore required.

- **RECEIVE ERROR.** This indicates that data is not being received by the logic board microprocessor. This error occurs if pins 2 and 3 are not jumpered or if there is a general UART (Universal Asynchronous Receiver/Transmitter) failure requiring service.

- **HANDSHAKE ERROR.** This error occurs if the plotter cannot toggle the hardware handshake lines (RTS and DTR). If pins 4 and 5 are properly jumpered, then the UART and/or the line drivers require service.

- **COMMUNICATIONS ERROR.** This indicates that a parity, framing, or overrun error has occurred. These errors are usually caused by a UART failure requiring service.

10.12 DRAM TEST

The DRAM TEST checks the logic board's DRAM (dynamic random access memory) circuits. Use this test if you suspect a memory error or to verify installation of additional memory in the plotter. This test does not require that a chart or pens be loaded.

To start this test, press the **ENTER** key when DRAM TEST is displayed. The plotter shows the memory areas under test on the top line of the display. Note that this test may take several minutes, depending upon the amount of memory. Upon successful completion, the plotter displays RAM ERRORS 00000000. If any other number is displayed, record the number and have the plotter serviced.

Power the plotter off, then on, after this test.

10.13 INSTALL MENU

The INSTALL MENU routine restores the menu settings in all four USER SELECT menus (Section 5) to the factory–selected values. This test does not require that a chart or pens be loaded. These values are as listed in Table 10–1.

TABLE 10–1. INSTALL MENU SETTINGS

MENU ITEM	VALUE (FOR ALL USERS)
User number	1
Clip	Default
Scale	Default
Viewport	Default
Pen velocity	24 ips (600 mm/s)
Pen tip size	0.35 mm
Velocity override	Host control
Pen acceleration	4 g
Media velocity (DMP-161)	32 ips (800 mm/s)
Media velocity (DMP-162 & DMP-162R)	24 ips (600 mm/s)
Media acceleration (DMP-161)	4 g
Media acceleration (DMP-162 & DMP-162R)	4 g
Carriage velocity	32 ips (800 mm/s)
Carriage acceleration	4 g
Up delay	30 msec
Down delay (DMP-161)	50 msec
Down delay (DMP-162 & DMP-162R)	70 msec
Number of pens	8

TABLE 10–1. INSTALL MENU SETTINGS
(Continued)

MENU ITEM	VALUE (FOR ALL USERS)
Pens/group	1
Language	DM/PL
Optimization	on
Menu units *	English
Auto capping	120 seconds
Chart feed ***	full roll
Load delay ***	0 minutes
Cut delay (SERVICE MODE)***	3 seconds
Pen pause	disable
Orientation	normal
Addressing *	0.001 inch
Text font *	F0
Text spacing *	proportional
Character set *	G0
Open fonts *	filled
Zero character	plain
Baud rate	9600 baud
Parity	even
RTS/DTR	high
DM/PL errors *	ignored
Line status **	standalone

NOTES:

* DM/PL only.
** HP-GL or HP-GL/2 only.
*** DMP-162R only.

SECTION 11
MAINTENANCE

11.1 INTRODUCTION

This section provides operator maintenance information for the plotter. This includes cleaning, voltage conversion, troubleshooting, pen changer, and service information.

11.2 CLEANING

The following paragraphs describe general cleaning, ink stains, chart sensor, and drum cleaning considerations.

11.2.1 General Cleaning

The plotter has several sliding surfaces. These are made of smooth metals and plastics so that they are essentially friction–free and require no lubricants. These may, however, collect dust and lint which may adversely affect the performance of the plotter. Keep the plotter as clean as possible by using a dust cover. When necessary, clean the unit with a soft lint–free cloth slightly dampened with isopropyl alcohol or mild detergent. **DO NOT** use abrasives.

11.2.2 Ink Stains

For ink on plotter surfaces, use a clean cloth slightly dampened in a concentrated solution of soap and water. Squeeze out excess water and then scrub the affected surface. Be sure that no water drips into the plotter since this may cause electrical shorting of the internal components. **DO NOT** use any aerosol cleaners, such as TV contact cleaner, household wall cleaners, or anything containing a solvent since these may damage certain components.

The pen changer pen stable pads can be cleaned using a lint–free cloth dampened with isopropyl alcohol.

11.2.3 Chart Sensor

For the optical chart sensor, improper chart sensing may result if dirt, dust, or other debris should collect in the chart sensor hole. It is located on the top right side of the rear platen as shown in Figure 11–1. When necessary, use compressed air or a small soft brush to clear debris from the hole above the sensor.
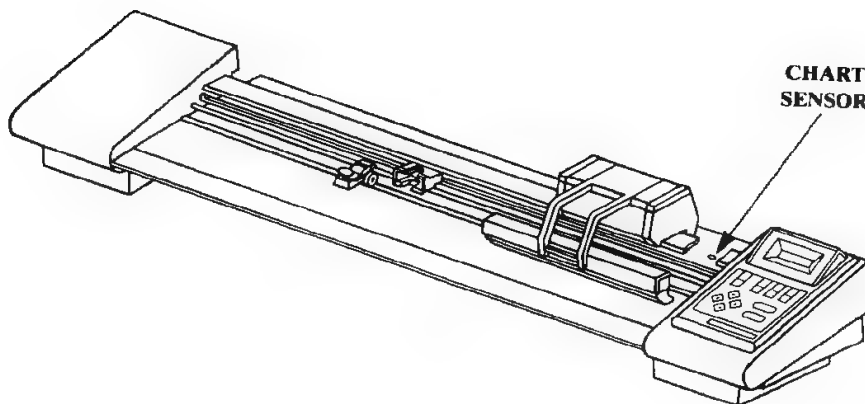
CHART SENSOR

FIGURE 11–1. CHART SENSOR

11.2.4   Drum

The friction area of the drum can become clogged with accumulated residue from chart material. This can cause slippage of the chart between the drum and the pinch rollers, resulting in inaccurate plots (tracking errors). The following steps explain how to clean the drum when necessary. Note that the special cleaning strips (part number DMP40–303) are available from your Houston Instrument product dealer or directly from Houston Instrument by calling toll free 1-800-776-9989 (512-873-1395).

1.   Power on the plotter and remove the chart.

2.   Press the **ONLINE** key.

3.   Remove the protective liner from the cleaning strip.

4.   Open the right pinch roller arm.

5.   Place the cleaning strip between the pinch roller and the drum, with the tacky side of the cleaning strip toward the drum as shown in Figure 11–2. Close the right pinch roller arm.

6.   Using the up arrow and down arrow keys, slew the cleaning strip back and forth several times until all residue is removed from the drum.

7.   Open the right pinch roller arm and remove the cleaning strip.

8.   Repeat Steps 5 through 7 for the left pinch roller at each chart size setting.

9.   Remove the strip. Press the **ONLINE** key.

10.   Residue can be removed from the cleaning strip by washing it in cold water. Thoroughly dry the cleaning strip and replace it in its protective lining.
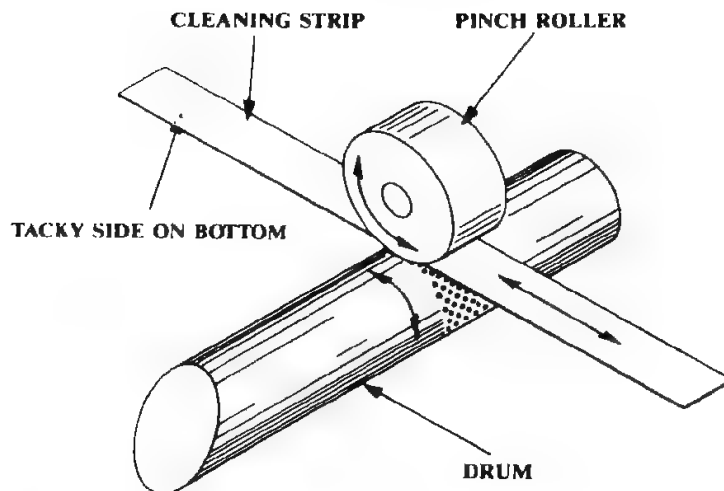
FIGURE 11–2. DRUM CLEANING

11.3 VOLTAGE CONVERSION

The plotter can operate on either 100, 120, 220, or 240 Vac line voltage. See Table 11–1 for the minimum and maximum operating ranges for these voltage ratings. The following paragraphs explain how to change the voltage setting and the fuse on the power entry module located on the bottom of the plotter.

CAUTION

The plotter MUST be set to the correct voltage before powering on. Otherwise, damage to the equipment may occur.

TABLE 11–1. POWER REQUIREMENTS

NOMINAL LINE	RANGE	FUSE
100 Vac *	89 to 108 Vac	1 Amp Slo–Blo
120 Vac *	108 to 130 Vac	1 Amp Slo–Blo
220 Vac *	197 to 228 Vac	0.5 Amp Slo–Blo
240 Vac *	216 to 260 Vac	0.5 Amp Slo–Blo

NOTES:

* 48 to 62 Hz, single–phase, 100 VA maximum.

The power entry module cover shows four possible voltage settings (100V, 120V, 220V, or 240V). Notice that a pin will be in one of these holes, indicating the present voltage setting for the plotter. If this setting does not match the voltage available at your site, then it MUST be changed before powering on the plotter. Figure 11–3 shows an example setting for 120 Vac operation.
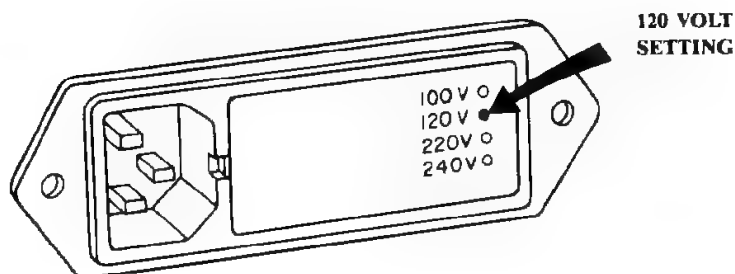
FIGURE 11–3. EXAMPLE 120 VOLT SETTING

Follow the steps below to change a fuse or convert the operating voltage.

1.   Set the plotter power switch off (0).

2.   Unplug the power cord from the ac wall outlet and from the power cord receptacle on the power entry module. See Figure 11–4.

3.   Using a small flat blade screwdriver or similar tool inserted into the slot at the left edge of the cover, carefully pry the cover off the fuse cavity.

4.   To change the voltage setting, grasp the white plastic voltage select board pin and pull straight outward until the voltage select board unseats from the power entry module. Hold the board so that you can read the four voltage selection labels (100, 120, 220, and 240) imprinted on the board. Move the voltage indicator pin to the opposite side of the board from the desired voltage label. Be sure to seat the pin in the notch provided on the board's edge. Install the voltage select board so that it is fully seated in the voltage select cavity (the label side toward the fuse cavity).

5.   To change the fuse(s), remove the fuse(s) from the fuse carrier on the back of the cover. For 100 or 120 Vac operation, the fuse rating is 1 Amp, Slo–Blo. For 220 or 240 Vac operation, the fuse rating is 0.5 Amp, Slo–Blo. Be sure to use the correct rating for your voltage selection. For installation, insert the fuse(s) of the proper rating into the fuse carrier.

6.   To change the fuse arrangement to match that used in your country, remove the screw from the fuse carrier, remove the fuse carrier, turn the fuse carrier so that the desired fuse arrangement (single fuse or dual fuses) is facing outward, install the fuse carrier, and install the screw.

      For United States type power operation, use a single standard AGC or 3AG 0.25x1.25–inch fuse of the correct rating.

      For European type power operation, use two standard 5.2x20 mm fuses of the correct rating. For European use, it is important to note that if your local electrical code does not allow a dual fuse arrangement, then a dummy fuse must be installed in the lower fuse carrier. Otherwise, the plotter will not operate.

7. Place the cover on the power entry module and press inward until it snaps into place. Verify that the desired operating voltage is indicated with the voltage select board pin on the cover label.

8. Connect the power cord to the power entry module and wall outlet. The plotter is now ready for operation on the selected ac line voltage.
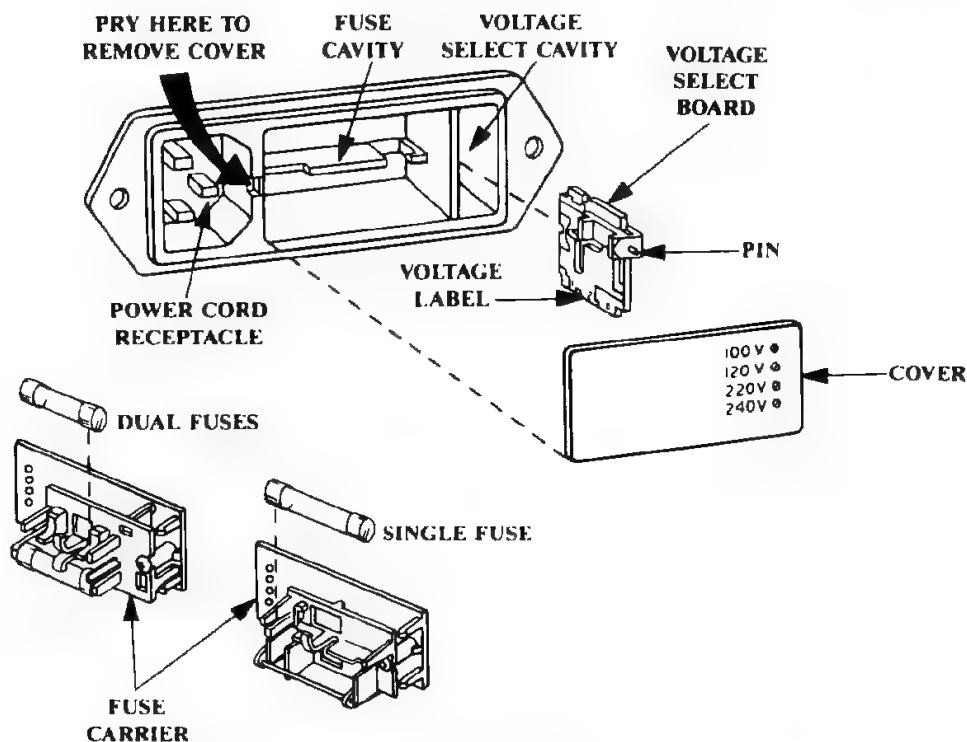

FIGURE 11–4. POWER ENTRY MODULE

11.4 PEN CHANGER

The MP–80 pen changer is installed as described in Paragraph 1.3.1 and normally needs no adjustments. The following paragraphs describe customer adjustments and maintenance that can be performed as needed.

11.4.1 Pen Changer Adjustment

If there are "pen crashes" into the pen changer, then perform the MP–80 INSTALL test described in Paragraph 10.6. Adjusting the horizontal position of the pen changer usually corrects this. If the problem persists, then perform the following vertical adjustment.

1.   Place the pen changer arm in the down position.

2.   Set the plotter power switch to ON (1).

3.   Loosen the four pen stable adjustment screws (see Figure 11–5).
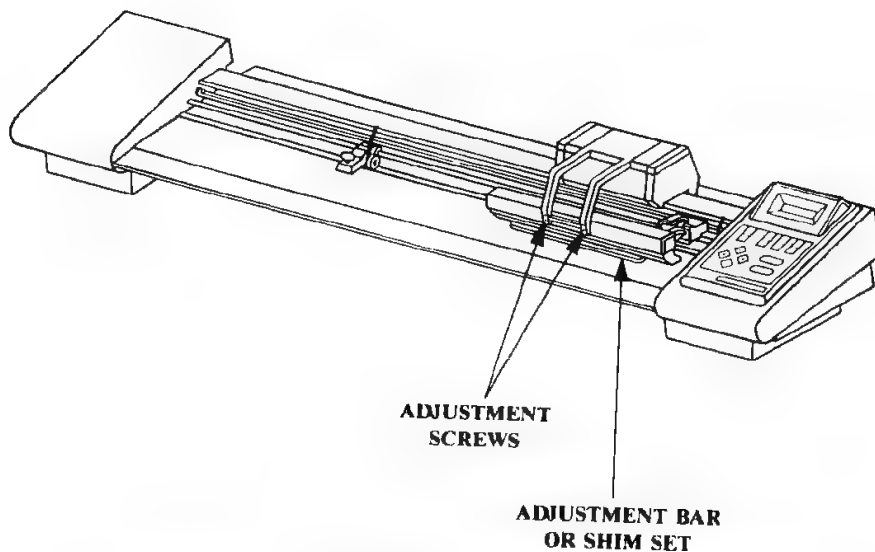
FIGURE 11–5. PEN CHANGER ADJUSTMENT

4. The pen changer is supplied with either a one–piece height adjustment bar or a two–piece shim set. For the adjustment bar, place it centered under the pen stable. For the shim set, place one under each end of the pen stable.

5. Adjust the pen stable so that it rests evenly on the adjustment bar or shim set. Tighten the four pen stable adjustment screws.

6. Raise the pen changer arm. Remove the adjustment bar or shim set. Lower the pen changer arm.

7. Double–check the height adjustment by placing the adjustment bar or shim set under the pen stable again. The pen stable is properly adjusted if it is no higher than 1/32 inch (0.8 mm) above the adjustment bar or shim set. Remove the adjustment bar or shim set.

8. Perform the MP–80 INSTALL and PEN–PEN TEST described in Paragraphs 10.6 and 10.7 to verify pen changer operation.

11.4.2 Pen Changer Pad Replacement

Loose or damaged pen stall pads can be replaced as described in the following steps.

1. Remove and discard the used pad from the bottom of the pen stall. Clean the pad area using a soft lint–free cloth dampened with isopropyl alcohol.

2. Remove the backing from the new pad (part number 384–1024). **DO NOT** touch the adhesive. These pads are available from your Houston Instrument product dealer, or direct from Houston Instrument by calling toll free at 1-800-776-9989 (512-873-1395).

3. Place the new pad, adhesive side down, into the pad area in the bottom of the pen stall.

4. Firmly press the pad with your finger to seat it. Allow a minimum of 24 hours for the adhesive to set before using the pen stall.

11.5   TROUBLESHOOTING

The troubleshooting procedures are listed by categories: general, plot quality, communications, scrolling errors, fixed errors, and HP-GL or HP-GL/2 errors. These are, in turn, organized as a listing of symptoms. Corrective actions are listed in the order of most likely first. Therefore, if a problem has more than one possible solution, perform them one at a time in the order given until the fault is corrected.

Please keep in mind that these descriptions cannot cover **EVERY** possible failure that the unit might have. These procedures do take into consideration the **MOST LIKELY** failure mode of the major components.

GENERAL:

PLOTTER FAILS TO POWER ON

Check the ac power source at the power outlet. Check the power cord. Check the fuse. Check the plotter power entry module voltage setting. Have the unit serviced.

CHART EJECTS DURING LOAD

Ensure that both pinch rollers are down. Clean the chart sensor (Paragraph 11.2.3). Have the unit serviced.

Y–AXIS ERROR

Remove any obstruction preventing the pen holder from moving. Have the unit serviced.

X–AXIS ERROR

Remove any obstruction preventing the drum from turning. Have the unit serviced.

CHART SKEWS LEFT OR RIGHT

Ensure that both pinch rollers are down. Clean the drum (Paragraph 11.2.4). Have the unit serviced.

PEN CHANGER FAILURE

Remove any obstruction preventing the pen changer from moving. Align and test the pen holder and pen changer (Paragraphs 10.6, 10.7, and 11.4). Have the unit serviced.

LCD IS UNREADABLE

If the display is set to an unreadable level and the plotter is otherwise operational, power the plotter off then on. After the power–up sequence is complete, press the **MENU** key two times to enter the LCD CONTRAST menu. Now use the up arrow or down arrow key to set an acceptable contrast.

PLOT QUALITY:

PLOT IS TOO LARGE

Check the plotting software configuration. Set QUICK SCALE menu larger (Paragraph 8.4). Set the ADDRESSING menu to 0.001 inch or 0.025 mm (Paragraph 7.25).

PLOT IS TOO SMALL

Check the plotting software configuration. Set QUICK SCALE menu smaller (Paragraph 8.4). Set the ADDRESSING menu to 0.005 inch or 0.1 mm (Paragraph 7.25).

PEN SKIPS

Check the chart and pen type compatibility (Paragraph 4.5). Set the VEL OVERRIDE menu to IGNORE HOST (Paragraph 7.6) and set the PEN VELOCITY menu slower (Paragraph 7.4). Set the DOWN DELAY menu longer (Paragraph 7.13). Have the unit serviced.

SHORT STRAY LINES ON PLOT

Check that media is flat, without wrinkles, creases or curls. Check height of pen tip when in up position (Paragraph 10.8). Set the UP DELAY menu longer (Paragraph 7.12). Set VEL OVERRIDE menu to IGNORE HOST (Paragraph 7.6). Have the unit serviced.

INK BLEEDS ON CHART

Use smallest acceptable pen tip size. Check media and pen compatibility (Paragraph 4.5). If bleeding is only at beginning of lines, shorten DOWN DELAY menu (Paragraph 7.13). If bleeding is only at end of some lines, shorten AUTO–CAPPING menu (Paragraph 7.22). Have the unit serviced.

STRAY LINES OR SPIKES ON PLOT

Check the plotting software configuration. Check the RTS/DTR menu (Paragraph 7.33). Check the data cable. Check the PARITY menu (Paragraph 7.32). For HP-GL or HP-GL/2, check the LINE STATUS menu (Paragraph 7.34). Have the unit serviced.

COMMUNICATIONS:

PLOT FAILS TO START

Check that plotter is online. Check the plotting software configuration. Check the data cable. Check the LANGUAGE menu (Paragraph 7.19). Check the BAUD RATE menu (Paragraph 7.31). Have the unit serviced.

PLOT STARTS THEN STOPS

It is typical for a plot to periodically stop and start when a clip window is set (Paragraph 8.5). Check the plotting software configuration. Set the PEN PAUSE menu to DISABLE (Paragraph 7.23). Check the data cable. Check the RTS/DTR menu (Paragraph 7.33). Check the PARITY menu (Paragraph 7.32). Have the unit serviced.

DM/PL ERRORS REPORTED

Check the plotting software configuration. Check the plot code. Check the data cable. Check the BAUD RATE menu (Paragraph 7.31). Check the PARITY menu (Paragraph 7.32). Check the RTS/DTR menu (Paragraph 7.33). Have the unit serviced.

SCROLLING ERRORS:

Following is a listing of the various scrolling error messages. If service is required for your plotter, contact the Houston Instrument Service Department. For other problems or questions, contact the Houston Instrument Technical Support Department. The toll free telephone number for both is 1-800-444-3425.

UNKNOWN INTERNAL ERROR
TURN POWER OFF

The plotter issues this error when it encounters unintelligible commands. This is usually caused by errors in the plot code sent to the plotter, not by the plotter itself. Check the plotting software configuration and send the plot code again. If the problem persists, contact the Technical Support Department.

ERROR IN X AXIS POSITION
TURN POWER OFF

The servo routine issues this error when the chart fails to achieve the required position. This is usually caused by a jammed chart or unusually high friction. Using unapproved (non–Houston Instrument) chart supplies may cause this problem. It may also be caused by internal software errors or electrical problems. Reload the chart and try again. If the problem persists, service is required.

ERROR IN Y AXIS POSITION
TURN POWER OFF

The servo routine issues this error when the pen fails to achieve the required position. This is usually caused by pen carriage collisions or unusually high friction. It may also be caused by internal software errors or electrical problems. Clean the pen carriage and pen bars. With the power off, verify that the pen carriage moves freely. If the problem persists, service is required.

LOW LINE VOLTAGE
TURN POWER OFF

The line voltage monitor issues this error when the line voltage is too low for safe operation of the plotter. Verify that the plotter is set for the correct operating voltage and that the line voltage range at your site is correct. See Paragraph 11.3. If the problem persists, service is required.

HIGH LINE VOLTAGE
TURN POWER OFF

The line voltage monitor issues this error when the line voltage is too high for safe operation of the plotter. Verify that the plotter is set for the correct operating voltage and that the line voltage range at your site is correct. See Paragraph 11.3. If the problem persists, service is required.

ILLEGAL PLOT COMMAND
1=RETRY 2=ABORT

The command decoding routines issue this error when illegal commands are encountered in the input data, but the plot could still continue successfully. Select RETRY to ignore the illegal command and attempt to continue the plot or select ABORT to abort the plot. Note that this error will not be seen unless DM/PL ERRORS is set to REPORTED in the CONFIGURATION menu.

ILLEGAL PLOT COMMAND
1=CONTINUE

The command decoding routines issue this error when illegal commands are encountered in the input data, and the errors are severe enough that the plot could not continue successfully. This error automatically aborts the plot and returns to ONLINE after CONTINUE is selected. Note that this error will not be seen and the plot will not be aborted unless DM/PL ERRORS is set to REPORTED in the CONFIGURATION menu.

ILLEGAL CLIP & SCALE SETTINGS
1=CONTINUE

The clip and scale calculation routine issues this error when an invalid set of clip and scale corners has been entered in the CLIP & SCALE menu. The clip and scale corners are set to default values when CONTINUE is selected. Any change to the CLIP & SCALE menu settings during a plot will abort the plot. Repeat the clip and scale procedures using legal settings.

SYSTEM NVRAM CHECKSUM FAILURE
1=CONTINUE

The power–up initialization routine issues this error when an invalid checksum is found for the system NVRAM (non–volatile random access memory) data. The system variables are set to default values after CONTINUE is selected. When plotting with default system values, the plotter is not calibrated, so accuracy specifications are invalid until the plotter is serviced. Note that the system NVRAM is not updated, so this error will happen on each power up until the plotter is serviced.

CUTTER MOTOR OVERCURRENT
TURN POWER OFF

This error will occur if the automatic cutter on the DMP-162R is obstructed. If the problem persists, service is required.

CUTTER TIMEOUT
TURN POWER OFF

This error occurs if the automatic cutter on the DMP-162R fails to complete an operation. If the problem persists, service is required.

USER MENUS HAVE BEEN DEFAULTED DUE TO ROM CHANGE
1=CONTINUE

The power–up initialization routine issues this error when it detects that the user NVRAM (non–volatile random access memory) data is incorrect for the ROM (read only memory) revision installed. All four sets of user menu variables are set to default values and the user NVRAM is updated. The power–up initialization will continue after CONTINUE is

selected. Only ROM revision changes in which the content of the user menus has changed will cause this error. Note that this error only occurs the first time the plotter is powered on following such a ROM change.

USER NVRAM CHECKSUM FAILURE
1=CONTINUE

The power–up initialization routine issues this error when an invalid checksum is found for the present user menu data. The user menu variables are set to default values after CONTINUE is selected. Note that the user NVRAM (non–volatile random access memory) is not updated, so this error will happen on each power–up until the problem is corrected in the CONFIGURATION menu by changing any value and pressing the ENTER key. Also, note that each of the four users menus has its own checksum, so a failure in one user menu does not affect the other user menus. If the problem persists, service is required.

SYSTEM NVRAM WOULD NOT ACCEPT VALUE WRITTEN TO IT
1=CONTINUE

The NVRAM (non–volatile random access memory) write routine issues this error when it fails to read back the value it has just written to a system NVRAM register. No special action is taken when CONTINUE is selected, and this failure will very likely result in checksum errors later. The NVRAM and its driving circuits may require service.

USER NVRAM WOULD NOT ACCEPT VALUE WRITTEN TO IT
1=CONTINUE

The NVRAM (non–volatile random access memory) write routine issues this error when it fails to read back the value it has just written to a user NVRAM register. No special action is taken when CONTINUE is selected, and this failure will very likely result in checksum errors later. The NVRAM and its driving circuits may require service.

SHEET EXCEEDS MAXIMUM LENGTH ALLOWED;
MAXIMUM LENGTH CAN BE USED
1=ACCEPT 2=ABORT

The load routine issues this error when an oversize sheet length exceeds 240 inches (6096 mm). Select ACCEPT to use the 240 inches (6096 mm) length, or select ABORT to abort the load. If the load is aborted, the plotter goes to SHEET NOT LOADED.

PAPER OUT INDICATED BY SENSOR
1=CONTINUE

The chart sensor monitor issues this error when the sensor indicates that it is uncovered when it should be covered or vice versa. This error automatically aborts any plot in progress, and the plotter goes to SHEET NOT LOADED or ROLL NOT LOADED after CONTINUE is selected. Clean the chart sensor as described in Paragraph 11.2.3. Check the PAPER SENSOR menu setting (typical value is 3) in the SERVICE MODE menu. If the problem persists, service is required.

PEN CHANGER POSITION CHANGED; RESTORE ORIGINAL POSITION
TO RETRY OR MOVE ALL PENS INTO CHANGER TO ABORT
1=RETRY 2=ABORT

The pen changer monitor issues this error when the up or down position of the pen changer arm is altered. Restore the original position and select RETRY, or select ABORT to abort the plot and accept the new position. Note that the pen changer monitor is not active during OFFLINE, RESET/LOAD, or MENU modes, so if the position is changed during these modes the error is not reported until the plotter returns to ONLINE.

PEN CHANGER FAILURE; MOVE ALL PENS INTO CHANGER
1=RETRY 2=ABORT

The pen changer routine issues this error when the pen changer mechanism fails to reach one of the sensor positions in the allocated time or when the current monitor detects that the pen changer motor is drawing too much power. This error is usually caused by a pen–to–pen crash or some other obstruction to the pen changer stroke. However, sensor failure, current monitor failure, or poor pen changer alignment could also cause this error. Select RETRY to try the pen changer operation again, or select ABORT to abort the plot. Note that the pens must be manually moved into the changer BEFORE either is selected.

PEN CHANGER FAILURE; COULD NOT MOVE CHANGER OUT
TURN POWER OFF

The pen changer routine issues this error when the pen changer mechanism fails to reach one of the sensor positions in the allocated time or when the current monitor detects that the pen changer motor is drawing too much power. This error could be caused by mechanical binding in the pen changer, sensor failure, current monitor failure, broken or worn drive belts in the pen changer. This error usually indicates that the pen changer and/or plotter require service.

PEN CHANGER REPEATEDLY FAILED, CLEAR OBSTRUCTIONS
AND CHECK ALIGNMENT
TURN POWER OFF

The pen changer routine issues this error when the changer has failed more than five consecutive attempts to change the pen. This indicates that the pen changer has an electrical or mechanical problem or that the pen changer is not aligned properly. Pen changer alignment is described in Paragraphs 10.6 and 11.4.1. If the problem persists, service is required

RS232 DATA ERROR DETECTED
1=RETRY 2=ABORT

The RS–232–C communications receiver routine issues this error when an invalid character is received or an input data buffer has overflowed. This is usually caused by baud rate, parity, or handshaking settings in the menu which do not match the settings of the computer. It may also be caused by incorrect wiring of the RS–232–C data cable. Select RETRY to ignore the error condition and attempt to continue the plot, or select ABORT to abort the plot. Note that this error will not be seen unless DM/PL ERRORS is set to REPORTED in the CONFIGURATION menu.

INTERNAL SOFTWARE ERROR — <origin>, [details]
1=CONTINUE

An internal software error has been detected which will cause the plot to be aborted. The
<origin> identifies the software routine in which the error was detected. The [details] are
optional short descriptions which identify the specific error trap. This type of error is not
expected to occur in release products. If this error does occur, please report the origin and
details to the Houston Instrument Service Department or Technical Support Department
(toll free telephone at 1-800-444-3425). Also, the sequence of operations and/or plot code
is useful for tracking down the internal error.

FIXED ERRORS

The following errors are fatal. For most of these, the plotter cannot operate until the cause of
the error is removed. Note that the displayed message may be slightly garbled due to the
severity of the error. If service is required for your plotter, contact the Houston Instrument
Service Department. For other problems or questions, contact the Houston Instrument
Technical Support Department. The toll free telephone number for both is 1-800-444-3425.

ROM CHECKSUM
ERROR

The power–up initialization routine issues this error when an invalid checksum is found for
the ROM (read only memory) data. This usually indicates that the ROMs should be
replaced, but other problems with the logic board circuitry could cause this error. If the
problem persists, service is required.

RAM ERROR
XXXXXXXX

The power–up initialization routine issues this error when it fails to read back the values
that were written to the RAM (random access memory) registers during the RAM test. The
RAM device which failed is identified by the displayed digits. If the problem persists,
service is required.

INTERNAL ERROR
NEC COMM FAILURE

The 68000 microprocessor to NEC controller startup routine issues this error when the 68000 microprocessor and NEC controller do not have perfect (error–free) communication. This is usually caused by electrical problems on the bus between the two devices, but may also be caused by a bad NEC controller. If the problem persists, service is required.

INTERNAL ERROR
68000 TRAP

The 68000 microprocessor experienced an internally generated error. This is usually caused by software errors, but can also be caused by an error on the 68000 microprocessor bus. Unlike other fixed errors, the plotter can usually be restored to operating condition by cycling the power off and on. If the problem continues with the same plot code, check the plotting software configuration. If the problem persists, then contact the Technical Support Department (1-800-444-3425).

HP-GL OR HP-GL/2 ERRORS

The error numbers listed in Table 11–2 are possible when HP-GL or HP-GL/2 is the active plotting language. The LCD message is "SYNTAX ERROR nn" for command syntax errors, or "DEVICE ERROR nn" for other errors, where "nn" is an error number listed in the table. These error numbers can also be retrieved by the plotting software using the HP-GL or HP-GL/2 Output Extended Error ESC.E or Output Error OE command.

Note that error numbers 1 through 14 and 18 result from problems in the plot code sent to the plotter. Check the plotting software configuration and verify the selected plotter type. Error numbers 15 through 17 indicate communications problems between the plotter and host computer. Check the data cable. Verify that the plotter and plotting software communications parameters are the same. If the problem persists, service may be required.

TABLE 11–2. HP-GL OR HP-GL/2 ERRORS

ERROR NUMBER	DESCRIPTION
SYNTAX ERRORS:	
0	No error. (Not reported on display.)
1	Instruction not recognized.
2	Wrong number of parameters.
3	Illegal character or out of range parameter.
4	Not used.
5	Unknown character set.
6	Position overflow.
7	Polygon buffer overflow.
8	Page advance command (AF, AH, FR, PG) received while in cut sheet chart mode.
DEVICE ERRORS:	
10	An output instruction was received while another output instruction was still executing. The original instruction continues normally, and the second instruction is ignored.
11	An invalid byte was received after the ESC. characters in a device–control instruction.
12	An invalid byte was received while parsing a device–control instruction. The parameter containing the invalid byte and all following parameters are defaulted.
13	A parameter is out–of–range.

TABLE 11–2. HP-GL OR HP-GL/2 ERRORS (Continued)

ERROR NUMBER	DESCRIPTION
14	Too many parameters were received. Excess parameters are ignored. Parsing of the instruction ends when a colon (normal exit) or the first byte of another instruction is received (abnormal exit).
15	Communications error. A framing error, parity error, or overrun error has been detected.
16	An input buffer overflow has occurred. One or more bytes of data have been lost and therefore, a syntax error or plot error will likely result.
17	Baud rate mismatch with host computer, or full–duplex communications error.
18	Indeterminate I/O error.

11.6 SERVICE SUPPORT

If you need technical assistance or if you suspect a problem with your Houston Instrument equipment, contact Houston Instrument at 1-800-444-3425. Please have the following information available **BEFORE** contacting our support personnel:

- The plotter's model number and serial number, which are printed on the identification tag on the back of the unit,

- The type of computer with which the plotter is being used,

- The name and revision number of the plotting software package,

- The cable configuration between the plotter and the computer,

- A copy of the latest MENU plot,

- A copy of the MENU or SERVICE plot, which provides the plotter's ROM revision levels (Paragraph 9.4 or 10.3).

- Any error message displayed on the control panel,

- The date of purchase,

- The type of maintenance agreement, if any,

- The name of the reseller, contact person, and phone number,

- A brief description of the problem.

SECTION 12
DM/PL COMMANDS

NOTE

If you have purchased a plotting software package, you may skip this section of the manual since that program will correctly handle the plotter's DM/PL inputs and outputs. DM/PL must be selected in the menu as the active plotting language in order for the plotter to respond to DM/PL–based plotting software. You only need to read this section if you are developing your own plotting program.

12.1 INTRODUCTION

This section contains information necessary to write plotting programs using the DM/PL plotting language. This includes general information for using DM/PL and a listing of the various DM/PL commands for this plotter.

12.2 DM/PL COMMAND FORMAT

The general format of the DM/PL commands is:

MNEMONIC(Parameter)

- *MNEMONIC* is the one or two character mnemonic (abbreviation) of the command. This is how the command must be sent to the plotter. The mnemonics are either uppercase or lowercase alphabetic characters or symbol characters, as shown in the DM/PL command listing.

- *Parameter* is additional data required for some of the commands. The parameters (if any) vary with the command.

12.3   DM/PL COMMAND ORGANIZATION

The DM/PL commands are described fully in the DM/PL Command Language Manual, part number MI–1044. The DM/PL manual is available as an option from your Houston Instrument product dealer or direct from Houston Instrument by calling toll–free: 1-800-776-9989 (512-873-1395).

The DM/PL manual describes all DM/PL commands used with various Houston Instrument plotters that support this language. Because of technical differences between the plotters, some of the commands require different parameters in order to operate properly with a given plotter. These commands are noted in the DM/PL manual. However, you will find that most of the commands operate exactly the same for all DM/PL–based plotters.

12.4   DM/PL COMMAND LISTING

Following is an alphabetical listing of the DM/PL commands supported by your plotter. The first line of the listing is the command name. The second line shows the command syntax and any parameters.

Note that these are the only DM/PL commands supported by this plotter. If the plotter receives a command that it does not support, the results cannot be predicted. Be sure to check this listing before running any software written for another DM/PL–based plotter to ensure predictable operation.

NOTE

DMP-160 Series Plotters are software compatible with DMP-60 and DMP-60 DL Series Plotters, unless otherwise noted below. If your version of the DM/PL manual does not specifically mention the DMP-160 Series Plotters, then any reference to the DMP-60 Series Plotters otherwise applies to these plotters.

Absolute
A

Arc
CA x,y,d or CA (Pn,Hn,Dn,Xn,Yn,Ln) x,y,d

Circle
CC x,y,r or CC (Pn,Hn,Dn,Xn,Yn,Ln) x,y,r

Closed Figure
CF border list CS or CF (Pn,Hn,Dn) border list CS

Coordinate Addressing
ECn

Curved Move
CM x1,y1,x2,y2,d or CM (Pn,Hn,Dn,Xn,Yn,Ln) x1,y1,x2,y2,d

Deselect
@

Digitize
ED

Down
D

Elapsed Time
EE

Ellipse
CE x,y,x1,y1,x2,y2 or CE (Pn,Hn,Dn,Xn,Yn,Ln) x,y,x1,y1,x2,y2

End Of Plot
e

End Of Text
ETnn

Extended Marker
M(Sn)m

Extended Text
S(Gn,Fn,Sn,Wn,Xn,Yn,Cn,Ln,I/NI,NP/P/V,TR/TD,Dn,Hn) character string _

Frame
Fn

Full Chart
EF(see par. 7.36)

General Curve
CG x1,y1,x2,y2, ... xn,yn CS

Half Chart
EH (see par. 7.36)

Home
H

Incremental Move
p, q, r, s, t, u, v, w, y, and z

Line
Ln or Ln+

Marker
Mhhm

Mode One Select
;:

Mode Two Select
;:Ipc d or ;:I(nn nn nn nn)pc d

Origin
O

Pass–Through Port Enable
X

This command is ignored by DMP-160 plotters.

Pen
Pn

Also see Paragraph 7.17.

Plot Pause
EL

Prompt Enable
EBnn

Query
Q

Plotter responds with its model number and ROM numbers enclosed within parentheses, followed by a carriage return character. For example: (DMP161 1358001 11359001 1351001) <CR> for a DMP-161, (DMP162 1258001 1359001 1351001) <CR> for a DMP-162, or (DMP162R 1358001 1359001 1351001) <CR> for a DMP-162R.

Relative
R

Report
ER

Reset
Z

Simple Text
Srhh character string_

Test
T or T(n)

UART Setup
EUnnn

Up
U

Vector Move
x,y

Velocity
Vn

Velocity of 1 to 32 ips (1 to 80 cm/s).

Window
W wxll,wyll wxur,wyur vpxll,vpyll vpxur,vpyur

SECTION 13
HP-GL COMMANDS

NOTE

If you have purchased a plotting software package, you may skip this section since that program will correctly handle the plotter's HP-GL emulation language inputs and outputs. HP-GL must be selected in the menu as the active plotting language in order for the plotter to respond to HP-GL–based plotting software. You only need to read this section if you are developing your own plotting program. Please remember that the HP-GL plotting language is not entirely transportable between all HP-GL plotters. This particular emulation of HP-GL is for software packages that support the HP DraftMaster SX/RX emulation of the HP 7585 plotter. Packages written for other HP-GL plotters may not work correctly.

13.1 INTRODUCTION

This section describes the HP-GL emulation language for the plotter. When using cut sheet charts, this language allows the Houston Instrument DMP-161 and DMP-162 plotters to emulate the HP DraftMaster SX/RX emulation of the HP model 7585B plotter. When using roll charts, this language allows the Houston Instrument DMP-162R plotter to emulate the HP DraftMaster SX/RX emulation of the HP model 7586B plotter.

This section contains the information necessary to write plotter programs using Houston Instrument's HP-GL emulation language. This includes general information for using HP-GL, and detailed descriptions of the various HP-GL commands for your plotter.

13.2 HP-GL COMMAND FORMAT

The general format of the HP-GL plotting commands is:

MNEMONIC parameter, (parameter) terminator

- The *MNEMONIC* is the two–letter mnemonic (abbreviation) of the command. The mnemonic can be sent as uppercase or lowercase alphabetic characters. (Uppercase mnemonics are used in this manual.)

- A space may follow the mnemonic and any parameter(s).

- The *parameter* or *(parameter)* is additional data required for some commands. Some commands do not require parameters, while others do. Optional parameters are indicated in this manual with parentheses. Do not include the parentheses with the command when sending it to the plotter. Unspecified optional parameters typically assume the previously specified value or the default value. At least one space or comma must separate multiple parameters. If all required parameters are omitted, the command is ignored.

- A *terminator* is used to denote the end of the command. The semicolon (;) is the only character recognized as a terminator. However, a following command can also be used as a terminator for a previous command. Therefore, only the last command in a string requires a specific terminator character. (In this manual, the semicolon is used as the terminator.)

  A carriage return (CR) is ignored, except when used as a label character or as an output response terminator. Note that the Label *LB* and Buffered Label String *BL* commands must be terminated with a specific label terminator character. The default value is the end of text (ETX) character. However, it can be changed with the Define Label Terminator *DT* command.

The general format of the HP-GL RS–232–C device control functions is as follows:

ESC.SYMBOL parameter; (parameter):

- *ESC* is the ASCII "escape" character. It is typically obtained from an ESCAPE key on a terminal or as a character sent by the plotting software.

- A period (.) must follow the escape character.

- A *SYMBOL* must follow the period. It must be a single ASCII character. The alphabetic symbols must be uppercase.

- The *parameter* or *(parameter)*, if any, follow the symbol. Some functions use parameters, while others do not. Some functions have optional parameters, which are indicated in this manual with parentheses. Do not include the parentheses with the command when sending it to the plotter. Multiple parameters must be separated by a semicolon (;). The last parameter must be followed by a colon (:). Note that any parameter not specified is set to the default value when a colon or semicolon is detected. It is important to note that the colon and semicolon are for use only with functions that have parameters. These must **NOT** be used with functions that do not have parameters. Otherwise, an error condition will result.

13.3   HP-GL COMMAND ORGANIZATION

The HP-GL instructions that your plotter supports are described in the *Hewlett–Packard 7580B, 7585B, and 7586B Drafting Plotters Interfacing and Programming Manual*. In addition to these, your plotter supports the Direction Vertical *DV* command used by the HP DraftPro Plotter. These are described in the *HP DraftPro Plotter Programmer's Reference*. Also, your plotter supports character sets 7, 17, and 27 used by the HP DraftMaster Plotter (these have six additional characters, but are otherwise identical to the HP 758X sets). The reference manual for these is the *HP DraftMaster Programmer's Reference*. These manuals are available from HP.

The HP-GL commands and RS–232 C functions that your plotter supports are listed in this section. These are the instructions used to control overall operation of the plotter. Unless otherwise described in this section, all listed HP-GL functions and commands are fully supported and operate exactly as described in the HP manual. Otherwise, be sure to observe the parameters given for the function to ensure predictable operation of the plotter.

Note that these are the only HP-GL instructions supported by your plotter. If the plotter receives an instruction that it does not support, the results cannot be predicted. Be sure to check this listing before running any software written for another HP-GL–based plotter to ensure predictable operation.

Also note that your plotter does not support the General Purpose Interface Bus (GPIB or HP–IB, ANSI/IEEE 488–1978 standard) communications interface and protocol described in the HP manuals. Your plotter always uses the RS–232–C serial communications interface and protocol described in Appendix B of this manual.

13.4   HP-GL COMMAND LISTING

Following is an alphabetical listing of the HP-GL commands supported by your plotter. The first line of the listing is the command name. The second line shows the command syntax and any parameters.

Absolute Character Size
SI; or SI width,height;

Absolute Character Slant
SL angle;

Absolute Direction
DI; or DI run,rise;

Acceleration Select
AS; or AS acceleration,(pen);

Advance Full Page
AF; PG; or PG1;

Advance Half Page
AH;

Arc Absolute
AA x,y,angle,(chord);

Arc Relative
AR x,y,angle,(chord);

Automatic Pen Pickup
AP; or AP control;

This command is ignored. For your plotter, a pen is automatically raised from the plotting surface after approximately two seconds of inactivity. This prevents the ink in the pen tip from bleeding on the chart. The plotter does, however, have an AUTO–CAPPING menu which enables you to specify a delay time before it returns a pen to its proper pen changer stall. Typical values that you can set are 15 seconds for drafting pens or 60 seconds for hard nib pens and roller ball pens before automatic storage to the pen changer stall.

Buffered Label String
BL label,terminator;

Character Plot
CP; or CP width,height;

Chord Tolerance
CT type;

If the Chord Tolerance *CT* command specifies chord deviation, or the Circle *CI*, Arc Absolute *AA*, Arc Relative *AR*, Edge Wedge *EW*, Fill Wedge *WG*, or Polygon Mode *PM* commands specify a chord of 5 degrees or less, then the plotter automatically uses a Houston Instrument smooth curve routine to draw the respective circle, arc, wedge, or polygon.

However, if the Line Type *LT0* command is in effect, the plotter automatically uses 5–degree chords to draw the dots at the plotted points for the deviation chord type. For chord angles (CT0;) while the *LT0* command is in effect, the plotter will use the specified degrees to draw the dots at the plotted points, even if the specified degrees are less than 5–degree chords.

Circle
CI radius,(chord);

Define Label Terminator
DT; or DT terminator;

Designate Alternate Character Set
CA; or CA set;

Note that this Houston Instrument plotter always draws the characters with an arc font. The character spacing is automatically adjusted to simulate HP fixed–space or variable–space arc or vector fonts. Character sets 0 through 59, and 99 are supported as shown in Table 13–1. All characters are available in each set; however, some characters may be formed slightly different than in the equivalent HP set. Character set –1 (the downloadable character set) and 101 (Kanji) are not supported.

TABLE 13–1. HP-GL CHARACTER SETS

PARAMETER			CHARACTER SET
FIXED–SPACE VECTOR FONT	VARIABLE–SPACE ARC FONT	FIXED–SPACE ARC FONT	
0	10	20	ANSI ASCII
1	11	21	HP 9825 plotter
2	12	22	French/German
3	13	23	Scandinavian
4	14	24	Spanish/Latin American
5*	15*	25*	Special Symbols
6*	16*	26*	JIS ASCII
7*	17*	27*	Roman Extensions
8	18	28	Katakana
9	19	29	ISO International Reference Version
30	40	50	ISO Swedish
31	41	51	ISO Swedish for names
32	42	52	ISO Norway Version 1
33	43	53	ISO German
34	44	54	ISO French
35	45	55	ISO United Kingdom
36	46	56	ISO Italian
37	47	57	ISO Spanish
38	48	58	ISO Portuguese
39	49	59	ISO Norway Version 2
99	—	—	Drafting

NOTES:

* Menu ZERO CHARACTER settings are ignored for this character set.

Designate Line
LT; or LT type,(length);

Designate Standard Character Set
CS; or CS set;

Note that this Houston Instrument plotter always draws the characters with an arc font. The character spacing is automatically adjusted to simulate HP fixed–space or variable–space arc or vector fonts. Character sets 0 through 59, and 99 are supported as shown in Table 13–1. All characters are available in each set; however, some characters may be formed slightly different than in the equivalent HP set. Character set –1 (the downloadable character set) and 101 (Kanji) are not supported.

Digitize Clear
DC;

Digitize Point
DP;

After receipt of the Digitize Point command, your plotter enters Digitize mode, as indicated by the control panel display. Press the **ONLINE** key. Use the control panel direction keys to position the pen over the desired point to be digitized. Press the **ENTER** key to enter the x–,y–coordinates. Typically, the Output Status *OS* command is sent to see if the plotter has digitized data to report. The plotting software then reads the digitized information with the Output Digitized Point *OD* command. Note that this plotter reports the last software–commanded up or down pen status as the digitized pen status.

Direction Vertical
DV; or DV (direction);

Edge Polygon
EP;

Edge Rectangle Absolute
EA xur,yur;

Edge Rectangle Relative
ER xur,yur;

Edge Wedge
EW radius,angle,sweep,(chord);

Extra Space
ES; or ES character,(line);

Fill Polygon
FP;

Fill Rectangle Absolute
RA xur,yur;

Fill Rectangle Relative
RR xur,yur;

Fill Type
FT type,space,angle;

Fill Wedge
WG radius,angle,sweep,(chord);

Initialize
IN;

Input Masks
IM; or IM (mask),(service),(poll);

The service and poll parameters are ignored since these only have meaning for the GPIB
(HP-IB) communications interface, which is not used with your plotter.

Input P1 And P2
IP P1x,P1y,(P2x,P2y);

Input Window
IW xll,yll,xur,yur;

Label
LB label,terminator;

Label Origin
LO; or LO location;

Not Ready
NR;

Upon receipt of this command, the plotter goes to local mode and extends the chart fully forward for viewing. The plotter displays the HP-GL NOT READY menu. Press the **1** key to load new media before going online or press the **2** key to resume with the present chart.

Output Actual Position
OA;

Output Carousel Type
OT;

This plotter always reports a drafting type carousel (3) and the number of pens enabled in the # OF PENS menu (1 for one pen, 3 for two pens, 7 for three pens, 15 for four pens, 31 for five pens, 63 for six pens, 127 for seven pens, or 255 for eight pens). For example, if the plotter has eight pens enabled in the menu, then the response is 3,255.

Output Character Box Dimensions
OB;

This plotter always responds to this command by sending all zeros (0.0000,0.0000,0.0000,0.0000).

Output Commanded Position
OC;

Output Digitized Point
OD;

Output Error
OE;

Output Factors
OF;

Output Hard–Clip Limits
OH;

Output Identification
OI;

To maintain software compatibility, a Houston Instrument plotter responds with an appropriate equivalent HP plotter model number as listed in Table 13–2.

TABLE 13–2. IDENTIFICATION RESPONSE

HOUSTON INSTRUMENT PLOTTER	HEWLETT–PACKARD PLOTTER
DMP-161	7585B
DMP-162	7585B
DMP-162R	7586B

Output Key
OK;

This plotter always responds to this command by sending a zero (0).

Output Label Length
OL;

Output Options
OO;

Output P1 And P2
OP;

Output Status
OS;

Note that bit 4 (ready for data) is always set for Houston Instrument plotters.
(For HP plotters, this bit can be cleared.)

Output Window
OW;

Pen Down
PD; or PD (x1,y1,x2,y2, ... xn,yn);

Pen Thickness
PT; or PT width;

Pen Up
PU; or PU (x1,y1,x2,y2, ... xn,yn);

Plot Absolute
PA x1,y1,(x2,y2, ... xn,yn);

Plot Relative
PR x1,y1,(x2,y2, ... xn,yn);

Polygon Mode
PM; or PM operation;

Print Buffered Label
PB;

Relative Character Size
SR; or SR width,height;

Relative Direction
DR; or DR run,rise;

Replot
RP;

Rotate Coordinate System
RO angle;

Scale
SC; or SC x1,x2,y1,y2;

Select Alternate Character Set
SA;

Select Pen
SP; or SP pen;

See Paragraph 7.17.

Select Pen Group
SG; or SG group;

This command is treated just like Select Pen *SP* command. Use the PEN/GROUP configuration menu (Paragraph 7.18) to extend the life of your pens.

Select Standard Character Set
SS;

Set Default Values
DF;

Symbol Mode
SM; or SM symbol;

Tick Length
TL positive,(negative);

User Defined Fill Type
UF gap1,(gap2, ... gap20);

Velocity Select
VS; or VS speed,(pen);

X–Axis Tick
XT;

Y–Axis Tick
YT;

13.5   HP-GL NO OPERATION (NOP) COMMANDS

The following HP-GL commands perform no operation (are ignored) by the plotter. They
do not apply to this plotter and are provided for software compatibility purposes.

Advance Frame
FR

Buffer Plot
BF

Character Chord Angle
CC

Character Selection Mode
CM

Designate Character Set Into Slot
DS

Downloadable Character
DL

Enable Cut Line
EC

Force Select
FS

Group Pen
GP

Input Character
IC

Invoke Character Set
IV

User Defined Character
UC

Velocity Adaptive
VA

Velocity Normal
VN

Write To Display
WD

13.6   HP-GL DEVICE CONTROL INSTRUCTIONS

Following is an alphabetical listing of the HP-GL device control instructions supported by your plotter. The first line of the listing is the command name. The second line shows the command syntax and any parameters.

Abort Device Control
ESC.J

Abort Graphic Control
ESC.K

Configure Memory
ESC.T (I/O);(polygon);(downloadable):

The downloadable parameter is ignored.

Output Buffer Size
ESC.L

Output Buffer Space
ESC.B

Output Extended Error
ESC.E

Output Extended Status
ESC.O

Output Identification
ESC.A

To maintain software compatibility, a Houston Instrument plotter responds with an appropriate equivalent HP plotter model number as listed in Table 13–2.

Output Memory Size
ESC.S buffer: or ESC.S:

Plotter Configuration
ESC.@ (buffer);(mode):

Plotter Off
ESC.Z or ESC.)

Plotter On
ESC.Y or ESC.(

Reset
ESC.R

Set Extended Output And Handshake Mode
ESC.N (delay);(t1; ... t10):

Set Handshake Mode
ESC.P mode: or ESC.P:

Set Handshake Mode 1
ESC.H (block);(enquiry);(r1; ... r10):

Set Handshake Mode 2
ESC.I (block);(enquiry);(r1; ... r10):

Set Monitor Mode
ESC.Q mode: or ESC.Q:

This instruction is ignored by DMP–160 plotters.

Set Output Mode
ESC.M (turnaround);(trigger);(echo);(terminator);(terminator);(initiator):

SECTION 14
HP-GL/2 COMMANDS

NOTE

If you have purchased a plotting software package, you may skip this
section since that program will correctly handle the plotter's HP-GL/2
emulation language inputs and outputs. HP-GL/2 must be selected in the
menu as the active plotting language in order for the plotter to respond to
HP-GL/2–based plotting software. You only need to read this section if
you are developing your own plotting program. Please remember that
the HP-GL/2 plotting language is not entirely transportable between all
HP-GL/2 plotters. This particular emulation of HP-GL/2 is for software
packages that support the HP DraftMaster SX/RX plotter. Packages
written for other HP-GL/2 plotters may not work correctly.

14.1 INTRODUCTION

This section describes the HP-GL/2 emulation language for the plotter. When using cut
sheet charts, this language allows the Houston Instrument DMP-161 and DMP-162 plotters
to emulate the HP DraftMaster SX/RX 7595B plotter. When using roll charts, this language
allows the Houston Instrument DMP-162R plotter to emulate the HP DraftMaster SX/RX
7596B.

This section contains the information necessary to write plotter programs using Houston
Instrument's HP-GL/2 emulation language. This includes general information for using
HP-GL/2, and detailed descriptions of the various HP-GL/2 commands for your plotter.

14.2 HP-GL/2 COMMAND FORMAT

The general format of the HP-GL/2 plotting commands is:

MNEMONIC parameter, (parameter) terminator

- The *MNEMONIC* is the two–letter mnemonic (or abbreviation) of the command. The mnemonic can be sent as uppercase or lowercase alphabetic characters. (Uppercase mnemonics are used in this manual.)

- A space may follow the mnemonic and any parameter(s).

- The *parameter* or *(parameter)* is additional data required for some commands. Some commands do not require parameters, while others do. Optional parameters are indicated in this manual with parentheses. Do not include the parentheses with the command when sending it to the plotter. Unspecified optional parameters typically assume the previously specified value or the default value. At least one space or comma must separate multiple parameters. If all required parameters are omitted, the command is ignored.

- A *terminator* is used to denote the end of the command. The semicolon (;) is the only character recognized as a terminator. However, a following command can sometimes be used as a terminator for a previous command. Therefore, only the last command in a string requires a specific terminator character. (In this manual, the semicolon is used as the terminator.)

  A carriage return (CR) is ignored, except when used as a label character or as an output response terminator. Note that the Label *LB* command must be terminated with a specific label terminator character. The default value is the end of text (ETX) character. However, it can be changed with the Define Label Terminator *DT* command.

The general format of the HP-GL/2 RS–232–C device control functions is as follows:

ESC.SYMBOL parameter; (parameter):

- *ESC* is the ASCII "escape" character. It is typically obtained from an ESCAPE key on a terminal or as a character sent by the plotting software.

- A period (.) must follow the escape character.

- A *SYMBOL* must follow the period. It must be a single ASCII character. The alphabetic symbols must be uppercase.

- The *parameter* or *(parameter)*, if any, follow the symbol. Some functions use parameters, while others do not. Some functions have optional parameters, which are indicated in this manual with parentheses. Do not include the parentheses with the command when sending it to the plotter. Multiple parameters must be separated by a semicolon (;). The last parameter must be followed by a colon (:). Note that any parameter not specified is set to the default value when a colon or semicolon is detected. It is important to note that the colon and semicolon are for use only with functions that have parameters. These must **NOT** be used with functions that do not have parameters. Otherwise, an error condition will result.

14.3   HP-GL/2 COMMAND ORGANIZATION

The HP-GL/2 instructions that your plotter supports are fully described in the *HP-GL/2 Reference Manual* and the *HP-GL/2 Comparison Guide*. These manuals are available from Hewlett–Packard.

The HP-GL/2 commands that your plotter supports are listed in this section. Unless otherwise noted, all listed HP-GL/2 functions and commands are fully supported and operate exactly as described in the HP manuals. Otherwise, be sure to observe the parameters given for the function to ensure predictable operation of the plotter.

Note that these are the only HP-GL/2 instructions supported by your plotter. If the plotter receives an instruction that it does not support, the results cannot be predicted. Be sure to check this listing before running any software written for another HP-GL–based plotter to ensure predictable operation.

Also note that your plotter does not support the General Purpose Interface Bus (GPIB or HP-IB, ANSI/IEEE 488 1978 standard) communications interface and protocol described in the HP manuals. Your plotter always uses the RS–232–C serial communications interface and protocol described in Appendix B of this manual.

14.4 HP-GL/2 COMMAND LISTING

Following is an alphabetical listing of the HP-GL/2 commands supported by your plotter. The first line of the listing is the command mnemonic and name. The second line shows the command syntax and any parameters.

Absolute Arc Three Point
ATxinter,yinter,xend,yend(,chord angle;)

Absolute Character Size
SIwidth,height(;) or SI(;)

Advance Page
PG(n); or PG;

Alternate Font Definition
ADkind,value... (,kind,value;)

HP-GL/2 character sets are listed in Table 14–1. Note that character sets 0, 14, and 277 map to character set 21; character set 38 maps to character set 6; and character set 267 maps to character set 43. Also note that type face parameters are ignored since Houston Instrument plotters always draw characters with an arc font.

TABLE 14–1. HP-GL/2 CHARACTER SETS

NUMBER	DESCRIPTION
277 (0)	Roman 8 (default)
21	ANSI US ASCII
14	ECMA 94 Latin 1
6	French v1
38	French v2
39	German
563	HP Drafting
531	HP-GL/2 Download
267	HP Kana 8
43	HP Katakana
5	HP Roman Extensions
595	HP Special Symbols
85	International Reference Version
9	Italian
11	JIS ASCII
4	Norwegian v1
36	Norwegian v2
147	Portuguese
115	Swedish
19	Swedish Names
83	Spanish
37	United Kingdom1.25

Anchor Corner
ACx,y(;) or AC(;)

Arc Absolute
AAxcenter,ycenter,sweep angle(,chord angle;)

Arc Relative
ARxincrement,yincrement,sweep angle(,chord angle;)

Begin Plot
BP(kind,value... (,kind,value);) or BP(;)

Any parameters included with Begin Plot *BP* are ignored.

Character Plot
CPspaces,lines(;) or CP(;)

Character Slant
SLtangent of angle(;) or SL(;)

Chord Tolerance Mode
CTmode(;) or CT(;)

If the Chord Tolerance *CT* command specifies chord deviation, or the Circle *CI*, Arc Absolute *AA*, Arc Relative *AR*, Edge Wedge *EW*, Fill Wedge *WG*, or Polygon Mode *PM* commands specify a chord of 5 degrees or less, then the plotter automatically uses a Houston Instrument smooth curve routine to draw the respective circle, arc, wedge, or polygon.

However, if the Line Type *LT0* command is in effect, the plotter automatically uses 5–degree chords to draw the dots at the plotted points for the deviation chord type. For chord angles (CT0;) while the *LT0* command is in effect, the plotter will use the specified degrees to draw the dots at the plotted points, even if the specified degrees are less than 5–degree chords.

Circle
CIradius(,chord angle;)

Default Values
DF(;)

Define Label Terminator
DTlabel terminator(,mode;) or DT(;)

Define Variable Text Path
DVpath(,line;) or DV(;)

Note that paths 2 and 3, and line 1 are not supported.

Digitize Clear
DC;

Digitize Point
DP;

After receipt of the Digitize Point command, your plotter enters Digitize mode, as indicated by the control panel display. Press the **ONLINE** key. Use the control panel direction keys to position the pen over the desired point to be digitized. Press the **ENTER** key to enter the x–,y–coordinates. Typically, the Output Status OS command is sent to see if the plotter has digitized data to report. The plotting software then reads the digitized information with the Output Digitized Point OD command. Note that this plotter reports the last software–commanded up or down pen status as the digitized pen status.

Direction Absolute
DIrun,rise(;) or DI(;)

Edge Polygon
EP(;)

Edge Rectangle Absolute
EAx,y(;)

Edge Rectangle Relative
ERx,y(;)

Edge Wedge
EWradius,start angle,sweep angle,(,chord angle;)

Extra Space
ESwidth(,height;) or ES(;)

Fill Polygon
FP(;)

Fill Rectangle Absolute
RAx,y(;)

Fill Rectangle Relative
RRx,y(;)

Fill Type
FT fill type(,option1(option2;))

Fill Wedge
WGradius,start angle,sweep angle(,chord angle;)

Initialize
IN n(;) or IN(;)

Input P1 And P2
IPp1x,p1y(,p2x,p2y;) or IP(;)

Input Relative P1 And P2
IRp1x,p1y(,p2x,p2y;) or IR(;)

Input Window
IW xll,yll,xur,yur(;) or IW(;)

Label
LB c ... c label terminator

Label Origin
LOposition(;) or LO(;)

Line Attributes
LAkind,value(,kind,value(,kind,value;))

Line Type
LTline type(,pattern length(,mode;)) or LT(;) or LT99(;)

Not Ready
NR(timeout;)

Upon receipt of this command, the plotter goes into the view state for the amount of time specified with the timeout parameter (in seconds), then returns to remote state.

Output Digitized Point And Pen Status
OD;

Output Error
OE;

Output Hard–Clip Limits
OH;

Output Identification
OI;

To maintain software compatibility, a Houston Instrument plotter responds with an appropriate equivalent HP plotter model number as listed in Table 14–2.

TABLE 14–2. IDENTIFICATION RESPONSE

HOUSTON INSTRUMENT PLOTTER	HEWLETT–PACKARD PLOTTER
DMP-161	7595B
DMP-162	7595B
DMP-162R	7596B

Output P1 And P2
OP;

Output Status
OS;

Note that bit 4 (ready for data) is always set for Houston Instrument plotters. (For HP plotters, this bit can be cleared.)

Pen Down
PD x,y(,...;) or PD(;)

Pen Up
PUx,y(,...;) or PU(;)

Pen Width
PWwidth(,pen;) or PW(;)

Pen Width Unit Selection
WUtype(;) or WU(;)

Plot Absolute
PA x,y(,...;) or PA(;)

Plot Relative
PR x,y(,...;) or PR(;)

Plot Size
PS(length(,width;)) or PS(;)

Polygon Mode
PMpolygon definition(;) or PM(;)

Polyline Encoded
PE(flag)(value)...(flag)(value);

Raster Fill Definition
RFindex(,width,height,pen number(,...pen number;)) or RFindex(;) or RF(;)

This command uses fill approximation.

Relative Arc Three Point
RTxincr inter,yincr inter,xincr end,yincr end(,chord angle;)

Relative Character Size
SRwidth height(;) or SR(;)

Relative Direction
DRrun,rise(;) or DR(:)

Replot
RPn(;)

Rotate Coordinate System
ROangle(;) or RO(;)

Scale
SCxmin,xmax,ymin,ymax(,type(,left,bottom;)) or
SCxmin,xfactor,ymin,yfactor,type(;) or SC(;)

Select Alternate Font
SA(;)

Select Pen
SPpen number(;) or SP(;)

See Paragraph 7.14.

Select Standard Font
SS(;)

Standard Font Definition
SDkind,value...(,kind,value;) or SD(;)

HP-GL/2 character sets are listed in Table 14–1. Note that character sets 0, 14, and 277 map
to character set 21; character set 38 maps to character set 6; and character set 267 maps to
character set 43. Also note that type face parameters are ignored since Houston Instrument
plotters always draw characters with an arc font.

Symbol Mode
SMcharacter(;) or SM(;)

Velocity Select
VS(pen velocity(,pen number;)) or VS;

14.5 HP-GL/2 NO OPERATION (NOP) COMMANDS

The following HP-GL/2 commands perform no operation (are ignored) by the plotter. They do not apply to this plotter and are provided for software compatibility purposes.

Character Fill
CF

Download Character
DL

Enable Cutter
EC

Frame Advance
FR

Media Type
MT

Merge Control
MC

Message
MG

Number Of Pens
NP

Pen Color Assignment
PC

Quality Level
QL

Screened Vector
SV

Set Color Range For Relative Color Data
CR

Sort
ST

Transparency Mode
TR

Transparent Data
TD

User–Defined Line Type
UL

14.6   HP-GL/2 DEVICE CONTROL INSTRUCTIONS

Following is an alphabetical listing of the HP-GL/2 device control instructions supported by your plotter. The first line of the listing is the command mnemonic and name. The second line shows the command syntax and any parameters.

Abort Device Control
ESC.J

Abort Graphics
ESC.K

Allocate Configurable Memory
ESC.T (physical I/O buffer);(polygon buffer);(downloadable
character buffer);(vector buffer);(pen sort buffer):

The downloadable, vector buffer, and pen sort buffer parameters are ignored for this
instruction.

End Flush Mode
ESC.U

This instruction is ignored by DMP-160 plotters.

Output Buffer Size When Empty
ESC.L

Output Buffer Space
ESC.B

Output Configurable Memory Size
ESC.S n:

Output Extended Error
ESC.E

Output Extended Status
ESC.O

Output Identification
ESC.A

To maintain software compatibility, a Houston Instrument plotter responds with an
appropriate equivalent HP plotter model number as listed in Table 14–2.

Plotter Off
ESC.Z or ESC.)

Plotter On
ESC.Y or ESC.(

Reset
ESC.R

Set Extended Output And Handshake Mode
ESC.N (intercharacter delay);(handshake dependent parameter):

Set Handshake Mode
ESC.P (handshake):

Set Handshake Mode 1
ESC.H (data block size);(enquiry character);(acknowledge string): or ESC.H:

Set Handshake Mode 2
ESC.I (XOFF threshold level);(omitted);(XON trigger character(s)):
or ESC.I(data block size);(enquiry character);(acknowledge string):

Set Output Mode
ESC.M (turnaround delay);(output trigger);(echo
terminator);(output terminator);(output initiator):

Set Plotter Configuration
ESC.@

APPENDIX A
GENERAL INFORMATION

A.1 INTRODUCTION

This appendix contains general information about the plotter. Paragraph A.2 defines specifications for the DMP-160 Series Plotter. Paragraph A.3 describes how various plotter parameters are affected by control panel LOAD, ABORT, or RESET operations. Paragraph A.4 describes how changes in the CONFIGURATION menu affect other parameters.

A.2 SPECIFICATIONS

Table A–1 is a listing of the DMP-160 Series Plotters specifications.

TABLE A–1. SPECIFICATIONS

ITEM	DESCRIPTION
WEIGHTS & DIMENSIONS:	
DMP-161 Height (including stand)	42 inches (1067 mm)
DMP-162 Height (including stand)	51 inches (1295 mm)
DMP-162R Height (including stand)	51 inches (1295 mm)
DMP-161 Width (including stand)	41 inches (1041 mm)
DMP-162 Width (including stand)	52 inches (1321 mm)
DMP-162R Width (including stand)	52 inches (1321 mm)
DMP-161 Depth (including stand)	21.75 inches (552.5 mm)
DMP-162 Depth (including stand)	27.25 inches (692.2 mm)
DMP-162R Depth (including stand and wireform basket)	40 inches (1016 mm)

TABLE A–1. SPECIFICATIONS (Continued)

ITEM	DESCRIPTION
WEIGHTS & DIMENSIONS (Continued):	
DMP-161 Weight (without stand)	30 pounds (13.6 kg)
DMP-162 Weight (without stand)	38 pounds (17.2 kg)
DMP-162R Weight (without stand)	54 pounds (24.5 kg)
DMP-161 Stand Weight	22 pounds (9.9 kg)
DMP-162 Stand Weight	30 pounds (13.6 kg)
DMP-162R Stand Weight (including rollfeed assembly and wireform, without media)	67 pounds (30.5 kg)
PERFORMANCE:	
Accuracy	On single–matte polyester (3 mil) at 18 degrees C, 0.2% of move or 0.010 inch (0.254 mm), whichever is greater
DMP-161 Plotting Speed	1 to 32 ips (1 to 80 cm/s) axial 1 to 45 ips (1 to 114 cm/s) diagonal
DMP-162 & DMP-162R Plotting Speed	1 to 32 ips (1 to 80 cm/s) carriage axis 1 to 24 ips (1 to 60 cm/s) media axis 1 to 40 ips (1 to 102 cm/s) diagonal
DMP-161 Acceleration	1, 2, 3, or 4 g axial up to 5.7 g diagonal
DMP-162 & DMP-162R Acceleration	1, 2, 3, or 4 g carriage axis 1 or 2 g media axis up to 4.5 g diagonal
Addressable Resolution	0.001 inch, 0.005 inch, 0.1 mm, or 0.025 mm
Repeatability (same pen)	+/–0.002 inch (0.050 mm)
Mechanical Resolution	0.0005 inch (0.0127 mm)

TABLE A–1. SPECIFICATIONS (Continued)

ITEM	DESCRIPTION
PENS AND MEDIA:	
Pen Types	Disposable Liquid Ink and Refillable Drafting pens with Stainless Steel and Tungsten tips, Fiber–tip pens, Roller Ball pens, Ceramic–tip pens.
Cut Sheet Types	Premium Plus Vellum, Translucent Bond, Matte Presentation Bond, Glossy Presentation Bond, Clear Acetate Film, Single–Matte Polyester Film.
Roll Chart Types	Premium vellum, standard vellum, translucent bond.
Chart & Pen Combinations	See Table 4–6.
DMP-162 & DMP-162R Cut Sheet Sizes	Engineering A, B, C, D, E, & F Architectural A, B, C, D, E, F, & 30x42 inches DIN A4, A3, A2, A1, A0, & B1 Oversize DIN A4, A3, A2, A1, & A0
DMP-162R Roll Chart Sizes	Standard widths from 22 to 36 inches (558 to 914 mm). Lengths up to 150 feet (45.7 m) or a maximum roll diameter of 4.5 inches (114.30 mm) on a standard 2-inch (50.80 mm) core.
Maximum Plot Areas	See Table 3–2
Type	Asynchronous serial RS–232–C
Plotter I/O Connector	Bottom panel RS–232–C DB–25P
Cable Mating Connector	RS–232–C DB–25S

TABLE A–1. SPECIFICATIONS (Continued)

PENS AND MEDIA (Continued):	
Transmit Data Format (from plotter)	7 data bits, 1 parity bit (selectable), 2 or more stop bits
Receive Data Format (to plotter)	7 or 8 data bits, 1 parity bit (selectable), 1 or more stop bits
Baud Rate	2400, 4800, 9600, 19200, or 38400
Buffer	512 kilobytes standard. 1, 2.5, or 4 megabytes optional. 1 megabyte standard on DMP-162R
Firmware	DM/PL, HP DraftMaster SX/RX HP-GL 7585 emulation, & HP DraftMaster SX/RX HP-GL/2
ENVIRONMENTAL:	
Operating Temperature DMP-161/162	40 to 95 degrees F (4.5 to 35 degrees C)
Operating Temperature DMP-162R	40 to 80 degrees F (4.5 to 26.6 degrees C)
Operating Relative Humidity DMP-161/162	20% to 95% (non–condensing)
Operating Relative Humidity DMP-162R	30% to 70% (non–condensing)
Storage Temperature	–40 to 140 degrees F (–40 to 60 degrees C)
Storage Relative Humidity	5% to 95% (non–condensing)

TABLE A–1. SPECIFICATIONS (Continued)

ITEM	DESCRIPTION
POWER REQUIREMENTS:	
Nominal Voltage	100, 120, 220, or 240 Vac (selectable)
Voltage Range	100 Vac setting: 89 to 108 Vac 120 Vac setting: 108 to 130 Vac 220 Vac setting: 197 to 228 Vac 240 Vac setting: 216 to 260 Vac
Frequency	50 or 60 Hz
Phase	Single phase
Power	100 VA maximum 52 VA standby for DMP-161 66 VA standby for DMP-162
Fuse	1 Amp Slo–Blo for 100 or 120 Vac 0.5 Amp Slo–Blo for 220 or 240 Vac

A.3 LOAD, ABORT, AND RESET PARAMETERS

Table A–2 lists parameter settings as a result of a control panel LOAD, ABORT, or RESET operation. Additional settings affected by only a RESET operation are listed in Table A–3. In these tables, the term "fixed" means that the condition always assumes the indicated value. The term "menu" value means that the condition always assumes the value presently set in the menu. Items that are plotting language specific are so noted.

TABLE A–2. LOAD AND ABORT PARAMETERS

CONDITION	TYPE
Auto cap delay	menu value
Chart size & orientation	actual chart size or menu setting
DM/PL Addressable resolution	menu value
DM/PL Character set	menu value
DM/PL Character text font	menu value
DM/PL Extended marker size = 8	fixed
DM/PL Extended Text height = 8	fixed
DM/PL Extended Text italic off	fixed
DM/PL Extended Text spacing P or V (script)	fixed
DM/PL Extended Text width = 8	fixed
DM/PL Line type = 0 (solid line)	fixed
DM/PL Mode 2 response string = <CR>	fixed
DM/PL Polygon fill parameter set to default	fixed
DM/PL Relative/absolute addressing cleared	fixed
DM/PL Text direction horizontal	fixed
DM/PL Text fill density = 15	fixed
DM/PL Text fillable fonts	menu value
DM/PL Text intercharacter extra spacing = 0	fixed
DM/PL Text interline extra spacing = 0	fixed
DM/PL Text path horizontal	fixed
Home and orientation (activated)	menu value
Media acceleration	menu value
Media speed	menu value
Number of pens	menu value
Pen down acceleration	menu value
Pen down speed	menu value
Pen up acceleration (maximum for plotter)	fixed
Pen up speed (maximum for plotter)	fixed
Window & Viewport	actual chart size or menu value

TABLE A–3. RESET PARAMETERS

CONDITION*	TYPE
Baud rate	menu value
Clear plot data buffer (all data lost)	fixed
Clears pen group definition	menu
Clip window (reset)	actual chart size
DM/PL End of text character = _	fixed
DM/PL Plotter deselected	fixed
DM/PL Prompt enable character = ^	fixed
Home and orientation (reset)	menu value
HP-GL & HP-GL/2 (No downloadable character buffer)	fixed
HP-GL & HP-GL/2 90 degrees rotation	menu value
HP-GL & HP-GL/2 Character chord = HI smooth curve routine	fixed
HP-GL & HP-GL/2 Character selection mode = always seven–bit	fixed
HP-GL & HP-GL/2 Character slant = 0 degrees	fixed
HP-GL & HP-GL/2 Chord tolerance = 5 degrees for arcs & circles	fixed
HP-GL & HP-GL/2 Clear label buffer	fixed
HP-GL & HP-GL/2 Clears any error condition	fixed
HP-GL & HP-GL/2 Default pen speed, force, acceleration set	fixed
HP-GL & HP-GL/2 Digitize mode cleared	fixed
HP-GL & HP-GL/2 Extra space = none	fixed
HP-GL & HP-GL/2 Fill angle = 0 degrees	fixed
HP-GL & HP-GL/2 Fill spacing = 1% of P1/P2 distance	fixed
HP-GL & HP-GL/2 Fill type = 1 (solid)	fixed
HP-GL & HP-GL/2 Input window set to hard clip limits	fixed
HP-GL & HP-GL/2 Label origin = standard labeling	fixed
HP-GL & HP-GL/2 Label terminator = ETX	fixed
HP-GL & HP-GL/2 Lift & store unused pen after auto–cap delay	menu value
HP-GL & HP-GL/2 Line pattern length = 4% of P1/P2 distance	fixed
HP-GL & HP-GL/2 Line type = 1 (solid)	fixed
HP-GL & HP-GL/2 Pen raised	fixed
HP-GL & HP-GL/2 Plot data buffer cleared	fixed

TABLE A–3. RESET PARAMETERS (Continued)

CONDITION*	TYPE
HP-GL & HP-GL/2 Plotter selected or deselected	menu value
HP-GL & HP-GL/2 Plotting mode = absolute	fixed
HP-GL & HP-GL/2 Polygon buffer cleared	fixed
HP-GL & HP-GL/2 Relative direction = horizontal	fixed
HP-GL & HP-GL/2 Relative size character height = 0.375 cm	fixed
HP-GL & HP-GL/2 Relative size character width = 0.285 cm	fixed
HP-GL & HP-GL/2 Select character set = standard set	fixed
HP-GL & HP-GL/2 Set to data buffer ready status	fixed
HP-GL & HP-GL/2 Sets P1/P2 & axis origin to chart size	fixed
HP-GL & HP-GL/2 Sets Status Word Bit 3 to 1	fixed
HP-GL & HP-GL/2 Standard character set = 0	fixed
HP-GL & HP-GL/2 Symbol mode off	fixed
HP-GL & HP-GL/2 XOFF character defined	fixed
HP-GL & HP-GL/2 XON character defined	fixed
HP-GL Tick length of x–axis tick = 0.5% of P2y–P1	fixed
HP-GL Tick length of y–axis tick = 0.5% of P2x–P1x	fixed
HP-GL User–defined fill = solid bidirectional	fixed
HP-GL/2 fill origin = 0,0	fixed
HP-GL/2 font spacing =fixed	fixed
HP-GL/2 height = 16	fixed
HP-GL/2 line ends = butt	fixed
HP-GL/2 line joins = mitered	fixed
HP-GL/2 miter limit = 5	fixed
HP-GL/2 pen location lower left (0,0)	fixed
HP-GL/2 pen width	menu value
HP-GL/2 pitch = 5.942	fixed
HP-GL/2 plot size = 1.5 times chart width	fixed
HP-GL/2 raster fill = solid	fixed
HP-GL/2 stroke weight = normal	fixed
HP-GL/2 TYPE FACE =FIXED VECTOR	fixed

TABLE A–3. RESET PARAMETERS (Continued)

CONDITION*	TYPE
HP-GL/2 WIDTH UNITS = METRIC (MM)	fixed
MAXIMUM WINDOW (RESET)	actual chart size
NORMAL CHART LENGTH	actual chart size
NUMBER OF PENS	menu value
PARITY	menu value
PLOTTER LANGUAGE	menu value
ROTATED CHART LENGTH	actual chart size
RTS/DTR MODE	menu value
SEND XON	fixed
WINDOW & VIEWPORT	actual chart size

NOTES:

* The conditions listed in Table A–2 are also set.

A.4   EFFECTS OF CHANGING CONFIGURATION PARAMETERS

Changes made to the CONFIGURATION menus described in Section 7 also affect the plotter as described in the following paragraphs.

Altering the PEN VELOCITY, PEN ACCEL, MEDIA VEL, VEL OVERRIDE, configuration menu causes all pen velocities and accelerations to be set to the menu values.

Changing the OPTIMIZATION, LANGUAGE, BAUD RATE, or PARITY menu causes a complete reset of the plotter like using the **RESET/LOAD** key to select RESET. This clears any clip or scale set with the CLIP & SCALE menu, completely reinitializes RS–232–C communications, defaults all plotting parameters, and clears all buffers.

Altering the ORIENTATION, ADDRESSING, CLIP & SCALE, or QUICK SCALE menu causes a partial reset like using the **RESET/LOAD** key to select ABORT. This aborts the present plot, advances to the next End Of Plot e command if DM/PL, and defaults all plotting parameters, except those set with the CLIP & SCALE menu.

Changes to the RTS/DTR menu causes the RTS and DTR handshaking lines to be set correctly for DM/PL. For HP-GL or HP-GL/2, hardware handshake is enabled, but if a plot is in progress, the handshaking lines may not be correctly set until the next handshaking threshold is reached.

Changes made to any one of the DM/PL TEXT FONT, TEXT SPACING, OPEN FONTS, or CHAR SET menus causes all of these to default to their menu settings.

Changes made to PENS/GROUP or # PENS in the CONFIGURATION menu or changing the current user in the USER SELECT menu resets the pen grouping parameters to their menu settings and restarts each group with its first pen.

Changes made to the UP DELAY, DOWN DELAY, AUTO–CAPPING, PEN PAUSE, MENU UNITS, ZERO CHAR, LINE STATUS, or DM/PL ERRORS menu are immediately implemented without affecting other plotting parameters.

Any change to the Model DMP-162R CHART FEED menu causes the plotter to assume a SHEET NOT LOADED or ROLL NOT LOADED condition. A plot in progress is not aborted, so loading a chart may result in a partial plot on the new chart. This is only likely to occur if HP-GL or HP-GL/2 is the active plotting language and STANDALONE is selected in the LINE STATUS menu. To prevent this, use the **RESET/LOAD** key to select RESET.

APPENDIX B
INTERFACE

B.1   INTRODUCTION

This appendix describes the RS–232–C serial communications interface signal connections for the plotter and the host computer. To connect the plotter to the host computer, always follow this priority:

1.   Refer to the plotting application software document for its recommended cabling specifications. If the DMP-160 Series is not specifically listed, cabling for other Houston Instrument DMP-29, DMP-40, DMP-50, DMP-60, or DMP-60 DL Series plotters can be used instead.

2.   If your plotting software does not list required cabling, then use the Houston Instrument cable specifications recommended for your particular computer. These are listed in Paragraph B.2.

3.   If you wish to make your own cable, then refer to Paragraph B.3. It lists the various plotter RS–232–C signals and how to connect them.

B.2   INTERFACE NOTES

The following paragraphs describe communication between a computer and plotter. These notes are arranged by computer configuration, and contain the following information, where pertinent.

•   **Cable Specifications.** A cable specification is given. The exact pin–for–pin description is detailed, as well as the type of connector needed on each cable end. These cable definitions establish a communications link between the computer and plotter to provide hardware and software handshake capability. The cable specifications described are general purpose and work with most software packages.

- **System Setup.** Instructions may be given to set up the computer's serial port. This setup is necessary to run the plotter with the computer. Information about setting up baud rate, parity, and handshake mode parameters for the plotter are given in Section 7.

- **Communication.** A BASIC program may be given that draws 110 circles horizontally across the chart. The purpose of this program is to demonstrate the communications abilities of the plotter and computer.

B.2.1 IBM And Compatible Computers

Cable Specifications:

For an IBM AT or compatible computer with a 9–pin serial port, use the data cable in the Houston Instrument Modular Serial Cable Kit, part number 414–183. If you would like to make your own data cable and use it instead of the Houston Instrument data cable, refer to Figure B–1 for connection information.
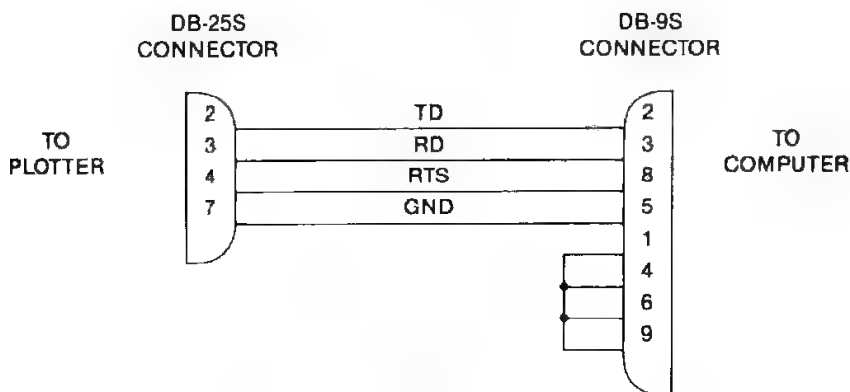
NOTES:
1. Unlisted pins are not connected.

FIGURE B–1. 25–PIN TO 9–PIN CABLE

For an IBM PC, IBM PC/XT, IBM PS/2, or compatible computer with a 25–pin serial port, use the data cable and 9–pin to 25–pin adaptor included in the Houston Instrument Modular Serial Cable Kit, part number 414–183. If you would like to make your own data cable and use it instead of the Houston Instrument data cable and adaptor, refer to Figure B–2 for connection information.

```
        DB-25S                              DB-25S
       CONNECTOR                           CONNECTOR

           2          TD              3
  TO       3          RD              2      TO
PLOTTER    4          RTS             5   COMPUTER
           7          GND             7
                                      6
                                      8
                                     20
                                     22
```
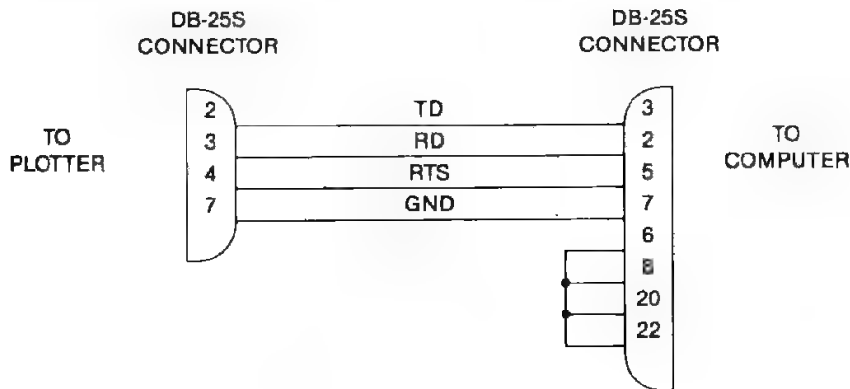
NOTES:
1. Unlisted pins are not connected.

FIGURE B–2. 25–PIN TO 25–PIN CABLE

System Setup:

NOTE

The following setup information assumes that you are using MS–DOS or PC–DOS.

1. Boot up the operating system.

2. After the system prompt, issue the following command to configure serial port one: MODE COM1:9600,N,8,2,P. If using serial port two, substitute COM2 instead.

3. After the system prompt, issue the following command to redirect output to serial port one: MODE LPT1:=COM1:. If using serial port two, substitute COM2 instead.

4. The computer end of the cable must be connected to the serial port defined as COM1 (or COM2). The plotter menu must be set for baud rate of 9600, parity of NONE, and RTS/DTR mode of TOGGLE.

Communications And Handshaking:

NOTE

The following BASIC program assumes that you are using IBM's BASICA or Microsoft's GW–BASIC.

1. After the system prompt, issue the command to load BASIC. For more information about loading BASIC, consult your computer documentation.

2. After loading BASIC, type in the program listing in Table B–1 for DM/PL, Table B–2 for HP-GL, or Table B–3 for HP-GL/2.

TABLE B–1. IBM SAMPLE DM/PL PROGRAM

PROGRAM	COMMENTS
10 LPRINT ";: ECM A H O V2 P1 200,200"	selects the plotter
20 FOR X = 500 TO 3225 STEP 25	defines x coordinate of center
30 LPRINT "CC ";X;",1200 100 "	outputs series of 110 circles
40 NEXT X	
50 LPRINT "P0 0,0 @"	puts the pen away & deselects plotter
60 END	

TABLE B–2. IBM SAMPLE HP-GL PROGRAM

PROGRAM	COMMENTS
10 LPRINT "IN;SP1;VS5;"	initializes the plotter & selects pen 1
20 FOR X = –5450 TO 5450 STEP 100	defines x coordinate of center
30 LPRINT "PA";X;",0000;CI400;"	outputs series of 110 circles
40 NEXT X	
50 LPRINT "SP0;PA0,0;"	puts the pen away
60 END	

TABLE B–3. IBM SAMPLE HP-GL/2 PROGRAM

PROGRAM	COMMENTS
10 LPRINT "IN;SP1;VS5;"	initializes the plotter & selects pen 1
20 FOR X = 500 TO 11400 STEP 100	defines x coordinate of center
30 LPRINT "PA";X;",1200;CI400;"	outputs series of 110 circles
40 NEXT X	
50 LPRINT "SP0;PA0,0;"	puts the pen away
60 END	

3.   To save the program, issue the following command:
SAVE "PLOTEST.BAS".

4.   You may now run the program. Issue the following command:
RUN. A sample plot is shown in Figure B–3.

5.   To load and run the program at a later date, issue the following command:
RUN "PLOTEST.BAS".

FIGURE B–3. SAMPLE PLOT

B.2.2   Apple And Compatible Computers

Cable Specifications:

For an Apple Macintosh Plus, Macintosh SE, Macintosh II, or compatible computer with an 8–pin DIN serial port, use the data cable and 9–pin to 8–pin adaptor cable included in the Houston Instrument Modular Serial Cable Kit, part number 414–183. If you would like to make your own data cable and use it instead of the Houston Instrument data cable and adaptor cable, refer to Figure B–4 for connection information.
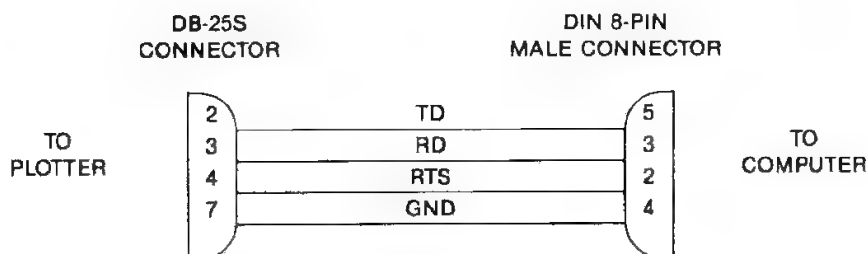
```
           DB-25S                        DIN 8-PIN
         CONNECTOR                    MALE CONNECTOR

              ┌──┐                         ┌──┐
              │ 2│          TD             │ 5│
   TO         │ 3│          RD             │ 3│        TO
 PLOTTER      │ 4│          RTS            │ 2│     COMPUTER
              │ 7│          GND            │ 4│
              └──┘                         └──┘

                          NOTES:
              1. Unlisted pins are not connected.
```

FIGURE B–4. 25–PIN TO 8–PIN DIN CABLE

For an Apple Macintosh 512K Enhanced or compatible computer with a 9–pin serial port, you must make your own data cable. Refer to Figure B–5 for connection information.
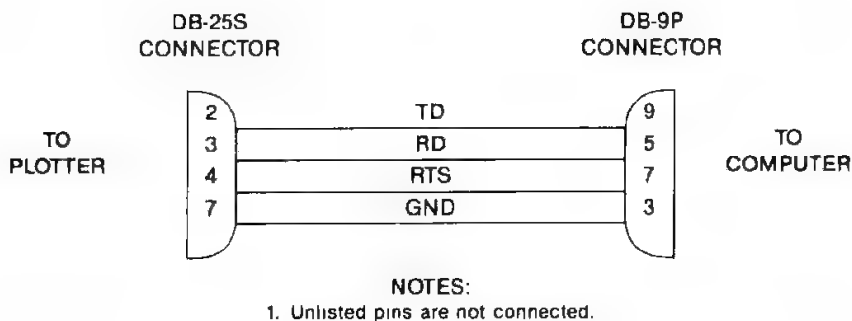
FIGURE B–5. 25–PIN TO 9–PIN DIN CABLE

B.3   AVAILABLE SIGNALS

Figure B–6 shows the seven signal connections available at the plotter 25–pin DB25P (pin) RS–232–C serial connector. These signals are explained in detail in the following paragraphs. All other connector pins are not used. The pin numbers listed below are the plotter RS–232–C connector pins.

- **Pin 1, Chassis Ground.** This chassis ground connection is provided for applications that require a frame–to–frame ground between the plotter and host computer. The signal ground is provided at pin 7.

- **Pin 2, Transmit Data (TXD).** This serial output line is used when the plotter sends data to the host computer. The plotter sends data on this line after receipt of operating commands requiring a response or during XON/XOFF or software handshaking.

- **Pin 3, Receive Data (RXD).** This serial input line is used when the plotter receives data from the host computer. This is how the plotter receives its operating commands and plot data.

- **Pin 4, Request To Send (RTS).** This output line may be used for hardware handshaking purposes to indicate the status of the plotter. This signal is enabled in the RTS/DTR menu as described in Paragraph 7.33. It may be set to HIGH if you do not wish to use it or set to TOGGLE (go high and low) if you do wish to use it. If TOGGLE is selected, the plotter sets RTS low to indicate that it is not ready to accept data. The plotter sets RTS high to indicate when it is ready to accept data from the host computer. Note that this pin is internally connected to pin 20 (DTR).

- **Pin 5, Clear To Send (CTS).** This input line may be used for hardware handshaking purposes to control operation of the plotter. To use it, the host computer sets CTS low to inhibit operation of the plotter. The host computer then sets CTS high to resume plotter operation. If not used, simply leave this line set on (high), or not connected at all.

- **Pin 7, Signal Ground (GND).** This is a required ground connection between the host computer and the plotter. It provides a common reference for all signal connections.

- **Pin 20, Data Terminal Ready (DTR).** This output line may be used for hardware handshaking purposes to indicate the status of the plotter. This signal is enabled in the RTS/DTR menu as described in Paragraph 7.33. It may be set to HIGH if you do not wish to use it. It may also be set to TOGGLE (go high and low) if you do wish to use it. If TOGGLE is selected, the plotter sets DTR low to indicate that it is not ready to accept data. The plotter sets DTR high to indicate when it is ready to accept data from the host computer. Note that this pin is internally connected to pin 4 (CTS).
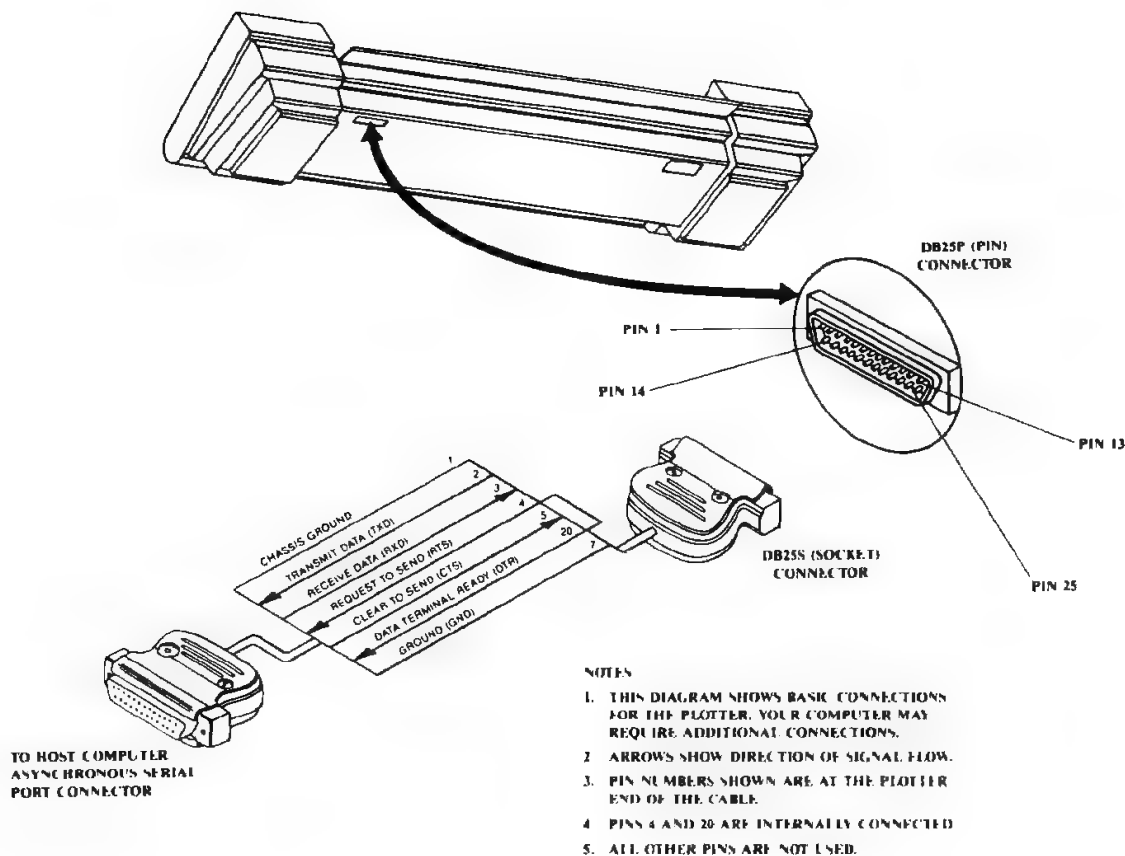
FIGURE B–6. AVAILABLE SIGNALS

In a typical XON/XOFF or software handshake application, only plotter pins 2 (TXD), 3 (RXD), and 7 (GND) are used. The host computer sends commands to the plotter on the RXD line. This is how the operating commands and plot data get to the plotter. The plotter responds when required by sending data on the TXD line. This is how the plotter sends handshake and response information back to the host computer. Pin 7 (ground) is used to establish a common reference for the other signals.

In a typical hardware handshake application, plotter pins 4 (RTS) or 20 (DTR) and 5 (CTS) are used in addition to pins 2, 3, and 7. The host computer monitors the RTS or DTR line from the plotter, and the plotter monitors the CTS line from the computer. This provides a hardware handshaking link between the plotter and the host computer. When RTS or DTR is high, the computer knows that the plotter is available for operation. When CTS is high, the plotter knows that the computer is ready for operation.

Typically, only a few plotter pins need to be connected to the host computer if making your own cable. Cable length should be limited to less than 16 feet (4.8 m) for best results. Note that your computer or plotting software may also require additional loopback connections at its end of the data cable.

- Connect the computer transmit data TXD pin to plotter pin 3.

- Connect the computer receive data RXD pin to plotter pin 2.

- For hardware handshaking, connect the computer clear to send CTS pin to plotter pin 4 or 20. Connect the computer request to send RTS pin to plotter pin 5.

- Connect the computer ground GND pin to plotter pin 7.

GLOSSARY

ABSOLUTE VECTOR PAIR. A coordinate set that references a specific origin point to determine a position on a plane.

ACCELERATION. The rate (in g or gravity force) at which the plotter accelerates the pen and/or chart to the specified velocity (plotting speed).

ADDRESSABLE RESOLUTION. The smallest movement increment that the host computer plotting software can select for the plotter. When DM/PL is active, addressable resolutions of 0.001 inch, 0.005 inch, 0.1 mm, or 0.025 mm are possible. Compare with mechanical resolution.

ASCII. Abbreviation for American Standard Code for Information Interchange.

ASYNCHRONOUS SERIAL DATA COMMUNICATIONS. A serial I/O protocol (RS–232–C) in which each byte transmitted is self–sufficient and does not require a timing sequence.

BAUD RATE. The rate in bits per second at which information is transmitted over a serial link.

BUFFER. A storage circuit that compensates for differences in data flow between two computing devices.

BYTE. A sequence of adjacent binary digits (bits), operated upon as a unit in a computer. A typical eight–bit byte forms one ASCII character.

CARTESIAN COORDINATES. A system of locating a point in a plane using two orthogonal (mutually perpendicular) axes known as x and y. Used as the basis for plotting by the DM/PL, HP-GL, and HP-GL/2 plotting languages.

CHARACTER SET. A collection of alphabetic, numeric, punctuation, and special symbols used for a particular plot. The most commonly used is ASCII. Alternate character sets include special alphabetic characters for various national languages and special symbols.

CHART. The material upon which the pen plots a drawing. Cut sheet charts and roll charts are available in a variety of sizes. Various chart material types include paper, vellum, clear film, and matte film.

CLIP. To plot only a certain portion of a larger plot. That is, clip points can be set on the plotter to exclude plot data that falls outside the specified limits.

COMMAND STRING. A collection of individual computer or peripheral commands that initiate or control predetermined operations.

COORDINATE SET (x,y). A pair of numeric specifiers that determine a single position on the plane of a coordinate axes system. A coordinate set can determine a position by either referencing a set origin point (absolute) or the position of the last vector pair (relative).

DATA. A general term for the numbers, letters, and symbols that serve as input or output for a computing device.

DIGITIZER. An electronic device that converts graphic information into digital computer data.

DM/PL. Houston Instrument's Digital Microprocessor/Plotting Language. The primary plotting language used to control the plotter with various graphics commands to produce plots.

HANDSHAKING. The process of transferring information between two devices in a synchronized manner at a rate acceptable to both devices (this process may be in either hardware, software, or XON/XOFF).

HEXADECIMAL. A notation in the scale (base) of 16, using alphanumeric digits 0 through 9 and A through F.

HP-GL. Hewlett–Packard Graphics Language. An alternate plotting language used to control the plotter with various graphics commands to produce plots. For DMP-160 Series Plotters, HP-GL is an emulation of the HP 7585 HP-GL plotting language.

HP-GL/2. Hewlett–Packard Graphics Language/2. An alternate plotting language used to control the plotter with various graphics commands to produce plots. For DMP-160 Series Plotters, HP-GL/2 is an emulation of the HP DraftMaster SX/RX HP-GL/2 plotting language.

I/O. Abbreviation for input and output data.

INCREMENT. The smallest possible unit of plotter movement.

INTERFACE. A working communication link between two or more computing devices.

ISO. Abbreviation for the International Organization for Standardization.

JIS. Abbreviation for Japanese Industrial Standard.

LCD. Liquid crystal display. Used in this plotter to show configuration and status information to the operator.

MECHANICAL RESOLUTION. The smallest movement increment that the plotter is capable of making. This plotter has a mechanical resolution of 0.0005 inch (0.0127 mm). Compare with addressable resolution.

MEDIA. The pen type and chart type used to produce a plot.

MIRROR PLOT. The ability of the plotter to produce normal, reverse, upside–down, and reverse upside–down plots.

PARITY. A method of adding a bit to a data byte during asynchronous (RS–232–C) communications to verify the integrity of the information transferred between two devices.

PEN. The device used to draw graphics on a chart. Various pen tip types include fiber–tip, roller ball, disposable stainless steel and tungsten, and refillable tungsten pens.

PLOT QUALITY. The ability of the plotter to produce acceptable plots using an approved media (pen and chart) combination at the recommended velocity and acceleration.

RAM. Abbreviation for Random Access Memory circuitry.

REPEATABILITY (%). The percent of fluctuation that will occur if the plotter produces the same plot design successively.

RELATIVE VECTOR PAIR. A coordinate set that references the location of the last vector pair to determine the next position on a plane.

ROM. Abbreviation for Read Only Memory circuitry.

RS–232–C. A specific asynchronous serial data I/O protocol used by the plotter for communications with the host computer.

SCALE. To alter the original position, orientation, size, or aspect ratio of a plot. That is, scale points can be set to alter the appearance of the plot.

SCANNER. An optical input device used to read information from an existing copy and save it as a computer file for further use.

VELOCITY. The speed (in ips or inches per second, or mm/s or millimeters per second) at which the plotter moves the pen and/or chart while plotting.

VIEWPORT. The lower left corner of the plot. Used to position the plot on the chart.

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